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NO. 26

ANNUAL REPORT

Of the Association of Ontario Land Surveyors

Organized 1886 Incorporated 1892

And PROCEEDINGS of the Nineteenth Annual Meeting since Incorporation, held

AT TORONTO

February 28th, March 1st and 2nd, 1911

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NOTICES.

MEMBERS and others will be supplied with copies of the Annual Reports for 1886, 1887, 1888, 1889, 1891, 1892, 1893, 1894, 1895, 1896, 1897, 1898, 1899, 1900, 1901, 1902, 1903, 1904, 1905, 1906, 1907, 1908, 1909, 1910 or 1911, upon remitting to the Secretary fifty cents for each copy required.

Each member of the Association is reminded of the fact that for the next Annual Meeting a good programme is most desirable, and to ensure its preparation it is not now too early to bear the matter in mind.

In addition to its use as a library, the Repository now serves as a drafting room for members when copying Crown Lands plans and notes.

Published annually by the Association of Ontario Land Surveyors. Edition, 1350 copies ; price, 50 cents.

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PREFACE.

To the Members of the Association of Ontario Land Surveyors:

The Proceedings of the Association at its Nineteenth Annual Meeting are herewith presented.

Respectfully submitted on behalf of the Council.

KILLALY GAMBLE,
Secretary.

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ASSOCIATION OF
ONTARIO LAND SURVEYORS

(INCORPORATED 1892)

Organized 23rd February, 1886.

OFFICERS FOR 1911-12

PRESIDENT

J. F. WHITSON.....Toronto

VICE-PRESIDENT

T. B. SPEIGHT.....Toronto

CHAIRMAN OF COUNCIL

G. B. KIRKPATRICK.....Toronto

SECRETARY-TREASURER

KILLALY GAMBLE.....Toronto

MEMBERS OF COUNCIL

HON. FRANK COCHRANE, Commissioner Lands, Forests and Mines.

G. B. KIRKPATRICK, Toronto. J. McC. WATSON, Orillia.	For term ending April, 1914.
P. S. GIBSON, Willowdale. C. H. FULLERTON, New Liskeard.	For term ending April, 1913.
ALEX. NIVEN, Haliburton. H. J. BEATTY, Eganville.	For term ending April, 1912.

AUDITORS

J. H. BURD.....Sudbury

N. A. BURWASH.....Toronto

BANKERS

Imperial Bank of Canada (Yonge St. Branch).....Toronto

BOARD OF EXAMINERS

G. B. KIRKPATRICK, (Chairman).

G. B. KIRKPATRICK, Toronto OWEN MCKAY, Walkerville	For 3 years.
P. S. GIBSON, Willowdale ALEX. NIVEN, Haliburton	For 2 years.
THOS. FAWCETT, Niagara Falls T. B. SPEIGHT, Toronto	For 1 year.

KILLALY GAMBLE (Secretary of Board).

NOTE.—Board meets at Department of Lands, Forests and Mines, Parliament Buildings, second Monday in February, 1912.

COMMITTEE, 1911-12

STANDING

LAND SURVEYING—J. M. Watson (Chairman), P. S. Gibson, J. Dickson, C. E. Fitton, T. B. Speight, H. J. Beatty, L. V. Rorke, W. J. Blair, H. T. Routly.

DRAINAGE—Geo. Ross (Chairman), C. A. Jones, J. J. Newman, A. S. Code, J. H. Moore, E. T. Wilkie, Geo. Smith, John Roger.

ENGINEERING—J. Hutcheon (Chairman), E. B. Barrow, Owen McKay, T. H. Jones, L. V. Rorke, A. P. Walker, R. McDowell, A. R. Davis, J. W. Fitzgerald.

TOPOGRAPHICAL SURVEY—T. Fawcett (Chairman), O. Klotz, L. B. Stewart, W. J. Moore, C. C. Fairchild, R. W. DeMorest, J. A. Wilde.

ENTERTAINMENT—A. T. Ward (Chairman), H. L. Esten, Killaly Gamble, W. A. McLean, N. D. Wilson.

PUBLICATION—Killaly Gamble (Chairman), H. L. Esten, A. J. van Nostrand, J. F. Whitson, W. A. McLean, D. D. James, A. G. Ardagh.

SPECIAL

LEGISLATION—G. B. Kirkpatrick (Chairman), James Dickson, J. W. Fitzgerald, P. S. Gibson, C. A. Jones, A. Niven, James Robertson, T. B. Speight, E. T. Wilkie, J. S. Dobie.

REPOSITORY AND BIOGRAPHY—H. L. Esten (Chairman), C. Unwin, G. B. Kirkpatrick, J. F. Whitson, A. J. van Nostrand, Killaly Gamble, H. T. Routly.

EXPLORATION—H. T. Routly (Chairman), J. W. Tyrrell, L. V. Rorke, John H. Shaw, J. S. Dobie, W. W. Stull, A. T. Ward.

POLAR RESEARCH—Willis Chipman (Chairman), L. B. Stewart, O. J. Klotz, Thos. Fawcett, J. W. Tyrrell, H. DeQ. Sewell, J. L. Morris.

PROGRAMME OF THE

Association of Ontario Land Surveyors

(INCORPORATED)

AT ITS NINETEENTH ANNUAL MEETING HELD AT TORONTO, FEBRUARY 28TH AND MARCH 1ST AND 2ND, 1911.

PROGRAMME

Tuesday, 28th February—Morning, 10 o'clock.

IN THE ENGINEERS' CLUB.

Meeting of Standing and Special Committees.
Meeting of Council of Management.

Afternoon, 2 o'clock.

Reading of Minutes of previous Meeting.
Correspondence.
President's address. J. F. Whitson.
Report of Council of Management.
Report of Secretary-Treasurer, (including Financial Statement).
Report of Board of Examiners.
Report of Committee on Legislation G. B. Kirkpatrick, Chairman.
Report of Committee on Publication Killaly Gamble, Chairman.
Report of Committee on Topographical Survey. Thos. Fawcett, Chairman.
Report of Committee on Exploration. L. V. Rorke.
Paper.—"Some Early Landmarks of Upper Canada." A. R. Davis.

Evening, 8 o'clock.

Lecture—"Hydro-Electric Development," illustrated by lantern slides Charles H. Mitchell.
Also views of scenes in Northern Ontario J. F. Whitson.

Wednesday, 1st March—Morning. 10 o'clock.

IN THE ENGINEERS' CLUB.

Report of Committee on Engineering. J. Hutcheon, Chairman.
Paper.—"Concrete Sidewalks." S. B. Code.
Paper—"Road Surface Treatment for Dust Laying and Preservation W. A. McLean.
Report of Committee on Drainage. Geo. Ross, Chairman.
Paper.—"Surveys." L. V. Rorke.
Paper—"The Forest and the Lumber Man." Elihu Stewart.
Paper—"Extracts from Archaic Records in the Surveys Branch." J. F. Whitson.

Afternoon, 2 o'clock.

Report of Committee on Land Surveying — A. Niven, Chairman.

Paper—"The Calendar." — Dr. King.

Paper—"Magnetic Surveys in Locating Ore Bodies." — R. W. DeMorest.

Paper—"Future Prospects of O. L. Surveyors in the Mining Districts of New Ontario." — C. H. Fullerton.

Paper—"Advantage of System in Extending Cities." — T. B. Speight.

Report of Committee on Repository and Biography. H. L. Esten, Chairman.

Report of Auditors. — E. T. Wilkie and H. L. Esten.

Thursday, 2nd March—Morning 10'clock.

IN THE ENGINEERS' CLUB.

Paper—"A Stadia Survey in Georgian Bay." — A. G. Ardagh.

Report of Committee on Polar Research. — Willis Chipman, Chairman.

Report of Committee on Entertainment. — J. F. Whitson, Chairman.

Nomination of Officers.—President, Vice-President, Secretary-Treasurer, two Members of Council, Auditors.

Unfinished Business.

New Business.

Adjournment.

ALEXANDER NIVEN, D.L.S., O.L.S.,
Registered Land Surveyor, 8th July, 1859.

[*See page 11*

AUTOBIOGRAPHICAL SKETCH OF ALEXANDER NIVEN, D. L. S., O. L. S.

Alexander Niven, D.L.S., O.L.S., one of Ontario's veteran land surveyors, died on May 7th, 1911, at the age of 75, in Victoria Hospital, Isabella Street, Toronto.

No surveyor in Ontario had a wider experience in this Province since 1859, when he became a Provincial Land Surveyor. He has been largely employed by the Government in exploring and running survey lines through the wilderness parts of Ontario. As an authority on the district along the height-of-land and the region of the James Bay slope, he ranked among the very first. He it was who ran the first meridian line to James Bay, passing through the Porcupine district, close to the now famous mines. It was on that trip in 1898 the first report of gold in that region was made.

Alexander Niven was noted among surveyors for his management of men, being famed for getting more line cut in a season than any other surveyor in the Province. Of late years his health had been failing, but he, nevertheless, continued upon strenuous survey trips in New Ontario for the Government every summer. He said that his health and strength improved each year on returning to the bush.

The inter-provincial boundaries of Ontario, Manitoba and Quebec were surveyed by Mr. Niven, while many of the "base" lines throughout New Ontario are those established by him.

A quiet, dry, slow-talking man, Alexander Niven was a remarkable example of the men who accomplish things without show. A member of the Ontario Land Surveyors' Association, he acted as President at the Meeting of their Association some years ago, without making an unnecessary speech or wasting a word. A wave of his hand or a motion of his head conveyed his meaning with quite sufficient clearness to the attentive explorers and land surveyors for whom his directions were intended.

Born at Niagara-on-the-Lake in 1836, Mr. Niven had for many years been a resident of Haliburton, Ontario, during such times of the year as he was not away at his work.

Here at different periods he was appointed stipendiary magistrate, warden of the county, and reeve of the township of Despard. He was a Liberal and a Presbyterian. A widow and two daughters survive him—Mrs. Paul Vine, of London, England, and Mrs. James Kettrick, of Toronto.

Minutes of the Nineteenth Annual Meeting

— OF THE —

Association of Ontario Land Surveyors

HELD AT THE ENGINEERS' CLUB, 96 KING ST. WEST, ON THE 28TH FEBRUARY AND 1ST AND 2ND MARCH, 1911.

The following members were present:

Abrey, George Spencer.
Ardagh, Arthur Gowan.
Attwood, C. H.
Barrow, Ernest George.
Beatty, David.
Beatty, Herbert John.
Blair, William John.
Bray, Lennox Thompson.
Browne, William Albert.
Browne, Wm. Herbert.
Burd, James Henry.
Burwash, Nathaniel Alfred.
Bush, Clayton Elgin.
Chase, Albert Victor.
Chipman, Willis.
Code, Abraham Silas.
Code, Samuel Barber.
Code, Richard Stanley.
Davis, A. R.
Dickson, James.
Dobie, James Samuel.
Eagleson, Francis Merwin.
Evans, John Dunlop.
Fairchild, William Howard.
Fitton, Charles Edward.
Fullerton, Charles Herbert.
Galbraith, John.
Gamble, Killaly.
Gibson, Peter Silas.
Gibson, Wilbert Silas.
Halford, Abraham Joseph Bartholomew.
Holcroft, Herbert Spencer.
Hutcheon, James.
James, Darrell Denman.
Jones, Charles Albert.
Jupp, A. E.
Kirkpatrick, George Brownly.
Le May, Tracy Deavin.
MacKay, James John.
McEvoy, Henry Robinson.
McLean, William Arthur.
Miles, C. F.
Moore, John Harrison.
Neelands, Ernest Wesley.
Niven, Alexander.
Patten, Thaddeus James.
Proudfoot, Hume Blake.
Robertson, James.
Ross, George.
Routly, Herbert Thomas.
Rutherford, T. N.
Sewell, Henry DeQuincy.
Shaw, John Henry.
Sing, Josiah Gershom.
Speight, Thomas Bailey.
Stewart, Elihu.
Tyrell, James Williams.
van Nostrand, Arthur J.
van Nostrand, John
Walker, Alfred Paverley.
Ward, Archeson Thomas.
Warren, James.
Watson, John McCormack.
Whitson, James Francis.
Wilkie, Edward Thomson.

On Tuesday, February 28th, at 2.30 p.m., the President, Mr. J. F. Whitson, took the chair, and, having called the meeting to order, said: Gentlemen, as the time is up, I wish to call this meeting to order, and the first thing on the programme is the reading of the minutes of the previous meeting.

The Secretary—As the minutes of the previous meeting have been already published in the proceedings they might be taken as read, and I would make a motion to that effect.

Mr. van Nostrand—I second the motion that the minutes of the previous meeting be taken as read. Carried.

The President—The next item on the programme is the correspondence.

The Secretary—There is no correspondence.

The President—The next thing is the President's address.

(The President then read his address which was received with applause.)

The President called for the report of the Secretary-Treasurer.

The Secretary (Captain Gamble) then read the report of the Secretary-Treasurer.

I wish to say before I sit down that I am sorry that, while the circumstances of Surveyors for the past few years have been so very flourishing, I have had more trouble this year in collecting the fees than I ever had before; and more than that, I have received fewer fees this year. I don't know why this should occur, unless it is that they find money so plentiful that they think the Association does not need it. Whenever there is a difficulty in collecting fees and we apply to our Solicitors they collect them immediately.

I will now read the financial statement. (Reads same.)

Mr. van Nostrand—I have pleasure in moving that the report of the Secretary-Treasurer be adopted and that the financial statement be submitted to the Auditors in the usual way.

On the motion being seconded by Mr. James Dickson it was adopted.

The President then called on Mr. G. B. Kirkpatrick to present the report of the Board of Examiners.

Mr. Kirkpatrick then read the report of the Board of Examiners, and moved, seconded by Mr. Niven, that the same be adopted. Carried.

The President then called on Mr. Kirkpatrick to read the report of the Council of Management.

Mr. Kirkpatrick read the same and moved, seconded by Mr. Beatty, that the report be adopted. Carried.

The President called upon Mr. Routly to read the report of the Committee on Exploration by Mr. Rorke.

Mr. Routly read the same, and after reading the report, said: I was not familiar with the writing of this report, although I fur-

nished some notes to Mr. Rorke. At a meeting of the Board of Trade in Haileybury the other night, called to devise ways and means for helping the town along a little, most of the speakers in the early part of the evening were of opinion that the time had come when we had to struggle pretty hard; the town had reached its limit, and was more likely to go back than forward. This seemed to be the opinion expressed by a number of the speakers on account of the fact that money is not as loose and easy and plentiful as it was when the boom was closer to Haileybury. That strain was followed for some time, until one of the members in the back of the room was called on, as a matter, apparently, of filling out the time. However, he made the speech of the evening, and his opinion and his speech was along the line that the world has never seen a condition of affairs as favorable as we have in Ontario to-day; that by reading the pages of history or studying the history of the present times there is no country in the world to-day nor ever has been that has the possibilities before it that Ontario has, especially Northern Ontario. This gentleman came from Newmarket. He showed that in Haileybury, within the limits where the town is built, there is as fine land as there is in the county of York, and that while the county of York is largely dependent on its agriculture, we had as good land there for agricultural purposes as in the county of York, and we had Cobalt with its silver deposits and Porcupine with its gold; and he said that Ontario is on the verge of a great development, that we are at the doorstep of the greatest period of extension and progression that we have ever seen. I think that his subject was along the right lines. Nothing has helped us more, and nothing has shown up the country to the north like the exploratory lines run by the Ontario Land Surveyors, especially the lines that were run about 1900, and the reports furnished by Surveyors, geologists and timber explorers at that time. I move the adoption of the report.

The motion on being seconded by Mr. Sewell was carried.

The President—In the absence of the Auditors, Mr. Wilkie and Mr. Esten, I will have to ask Mr. Burwash and Mr. Burd to act as Auditors.

The next item on the programme is the report of the Committee on Topographical Survey, to be presented by Mr. Fawcett, the Chairman.

(In the absence of Mr. Fawcett this report was allowed to stand over.)

The President called upon Mr. A. R. Davis to read a paper on "Early Landmarks of Upper Canada."

Mr. Davis then read his paper and prefaced it with the following remarks: Mr. President and gentlemen: The subject developed somewhat after I had given Captain Gamble a title for it and I took a larger title, "Some Early Landmarks of Upper Canada," and if you will just throw your minds back for a century or so and forget all this extension and development of the present day you will be in harmony with the thoughts that I have to give you for the next few minutes.

The reading of the paper was greeted with applause.

Mr. Dickson—Mr. President, Mr. Davis's paper was somewhat long, but not too long; it has been very interesting and I have listened to it and received a good deal of information which I didn't have before. I have much pleasure in moving that the report be accepted and printed in the minutes.

Mr. Kirkpatrick—I have much pleasure in seconding this. I think we are indebted very much to Mr. Davis for giving us that nice interesting history of Central Canada. I dare say he got a good deal of it out of our papers on file in the Department. If we only had the time to read them I think we would find a mine of wealth in them yet—an unexplored gold mine.

The President put the motion which, on a vote having been taken, was declared carried.

The President—The programme for this afternoon has been pretty well exhausted, but I understand some gentlemen wish to discuss some questions in land surveying, and if they will bring them forward now we will have the opinions of the members while they are here this afternoon and while we have plenty of time.

Mr. Routly, have you not some point to bring up in connection with Northern work.

Mr. Routly—I sent two or three questions to the Question Drawer. If it is all right I can bring them up now.

The President—Yes, I think this would be a good time.

Mr. Routly—One of the questions I wished to bring up was the method of sub-dividing what is called a full lot. (Makes diagram on blackboard.) This is a little square block; the measurements given on the original plan would be 80, 80, 40, 40, 40 and 40. On traversing the block we find it somewhat similar to this. This may be possibly 82. They frequently come up to more than that. We will suppose the blind line has been run on the same astronomical bearing as the governing line and we have to sub-divide this into

eight mining claims. The measurement found here is 41 chains, here 38, here 81.50 and here 78.50. This is a question we have to do with in the north country. These lines may even be quite a good deal out. We frequently find these lines on the ground. Leaving that for the present, what is the method approved of by this Association for sub-dividing a full lot which at present is found to be quite irregular, like that.

The President—Mr. Shaw, you are up against this kind of thing all the time. What do you say?

Mr. Shaw—In the case of mining claims, the first thing is to get the line between the south half and north half. For that I run a line on the mean of the bearings between the north and south boundaries, so as to make equal areas. Then there is the description of the northwest quarter, which is quite misleading. It might be the west half of the north half, or the north half of the west half. It is misleading there, but the first thing to do is to get the line between the north and south half. That, in the case of crooked boundaries, should be taken into consideration. But I have always adhered to making the line on the mean of the bearings of the north and south boundaries. That is where they are unmapped, of course.

The President—Under the Mines Act lots are divided as the northeast quarter of the north half, the northwest quarter of the north half, the southeast quarter of the north half and so on, as dividing the lot into north and south half. The point is whether the division line between the north and south half should be a line parallel to the south boundary or to the north boundary or the mean of it. Mr. Shaw says he would run it on the mean of the two boundaries.

Mr. van Nostrand—I think we have no legislation that settles that point in any way.

The President—I think the Act is amended now to get over the point entirely. Under the present Act the division line between the north and south half will be a line joining midway points on the two boundaries. That would be irrespective of area.

Mr. van Nostrand—We are wasting time on this question if it is covered.

The President—It is covered. The old Act might apply in cases where part of the lot had been disposed of before the passing of this Act.

Mr. van Nostrand—That is one of the proofs of the Committee's good work. It is one of the things I have been guessing at ever since I have been reading the Act.

Mr. P. S. Gibson—There are surveys in the township of York where we find the same difficulty, when the lot at the rear end is wider than at the front. I have had the question submitted to me and I have explained it was simply a wrong or incorrect description. This is a case of the same kind. I would not be responsible as a surveyor to make a survey of that kind. We have numbers of lots in the Township of Markham and in the Township of Vaughan where we have the same difficulty. The front is very wide and the rear is as wide again, and the same difficulty has occurred.

The President—Is it your custom to divide the frontage equally?

Mr. P. S. Gibson—I have left it always to the parties selling the land; I have said, that is an incorrect description and when you are selling the land you can sell any part you want to.

The President—Supposing a mistake were made in describing the lot as the east half of the lot.

Mr. P. S. Gibson—The parties can settle that themselves or let the Courts do it until the Act is amended.

Mr. Kirkpatrick—If any gentleman wants a copy of the new Act I have copies here both of the Surveyor's Act and the Act relating to surveys. You will find that set out in Section 31, Subsections 2 and 3. (Reads same.) That is the new clause. That makes it all perfectly clear. If you go into half quarters and quarter quarters it will do the same thing, although the Act does not say so.

Mr. Routly—How is the line run between the east and west half according to the reading of the Act?

The President—The line between the east and west half is a line drawn on the same astronomical course from a midway point on the front of the lot.

Mr. Shaw—Supposing you struck the west boundary before you got to the north boundary?

Mr. Kirkpatrick—Whenever a surveyor is in doubt about anything that is not clearly set out in the Act he can apply to the Minister.

Mr. Shaw—I had occasion once to lay off twenty acres and had I done so from the front of the lot I would have struck the west boundary rather than the south, and it seemed so ridiculous to do that that I divided proportionately along both boundaries as the most sensible thing to do, as the Act was not clear. I think there was some seven chains difference between the north boundary and south boundary of that lot.

Mr. Routly—It seems to me that the new method is going to be pretty hard to carry out in our country. One of the most difficult things to get in the north country is an observation; I have known a delay for two weeks to get an observation. If we have to run these lines on the astronomical course it will be next to impossible to run some of them without waiting for a long time.

The President—That has been the law so far as refers to Parry Sound, Muskoka and Nipissing since 1897, and I don't think there has been any serious objection from that standpoint.

Mr. Shaw—I have run a great number of lines under it and I have seldom been three days without being able to get an observation.

Mr. Gibson—Can you find the side lines?

Mr. Shaw—Sometimes you can find them very satisfactorily. I believe the astronomical direction is an improvement on running on the governing lines from my experience at North Bay. Some exceptions should be made in that new Act for blocks with lines already run. Is there anything in it?

The President—Oh, yes.

Mr. Gibson—I have found it sometimes quite difficult to get the side road. I think on the whole the astronomical course is the best way.

Mr. Routly—This is the governing line; these lines are quite distinct on the ground and quite narrow and easily found. This line is straight through on both concessions and so is this one. This post is here. It is off this line about seven or eight links. The bearing tree is about here, the blazing facing that post, and there is an indication of the post having been here. The post when I visited the ground had been changed around, but I had information that when my men first went there a year or so ago they found some stones that would indicate the post had been slightly altered. This is a very important line, it is the governing line for a very important survey. What is the true position of this corner?

Mr. Gibson—Was the line well defined?

Mr. Routly—Yes, both lines are straight for a considerable distance on both sides of the corner. The bearing tree is still on the ground and the post about seven links off the line.

Mr. Gibson—I would say follow the blazed line.

Mr. Beatty—How far away is your nearest blaze? A good deal further away than the corner post?

Mr. Routly—On the east and west line they are quite close; on the north and south line there is a blazed tree not more than 50 or 60 feet north and not more than 20 or 30 feet south.

Mr. Sewell—The post would certainly govern when it is found from the bearing tree.

Mr. Gibson—Does the post occupy the same position relative to the bearing tree as it is said to occupy in the return to the Department?

Mr. Routly—The post when first found was lying down some distance from the corner, but the bearing tree is still standing.

The President—I suppose the position of the post is without question; it can be established from the notes. The question is will you use the post or the intersection of the line.

Mr. Beatty—I should think the post would be far better evidence than the blazed line.

The President—How are you going to locate the line from the post? Where are you going to draw your line to strike your first blaze from the post?

Mr. Beatty—How would you do it in any case? This problem would come up in a thousand and one cases.

Mr. Shaw—The problem comes up before me in a thousand acre block. The question is what is the governing line of that lot? Is it the centre line or the line joining the posts at the angles of the lot?

Mr. Gibson—Take the blazed line.

Mr. Beatty—It has often struck me there should be something to decide how you would establish a line from a blaze. You find an old blaze that you are not satisfied was an original blaze, and you find another ten or twenty chains away. How far would you keep off that blaze for your line? This is something I think the Association should try and get some illumination on.

The President—If I am allowed to make a few remarks on the same subject, the greatest difficulty we have in the Department is in mistakes in descriptions that come in in that way. (Makes sketch.) This is the blazed line, that is about the position of it on the ground. Now I am asked to make a description of the north-east 40 acres of this lot. I start at this point and I run west along the north boundary 20 chains, thence southerly parallel to the east limit. Now, am I running parallel to that boundary or parallel to a line joining these points?

Mr. Routly—The east boundary of the lot.

Mr. Gibson—Follow the line defined on the ground.

The President—Is that line between parallel to a point joining the blazed lines there?

Mr. Gibson—Of course.

Mr. Watson—I think it should be from end to end. For instance those blazes disappear intermediately.

Mr. Beatty—If the description would read, parallel to the east boundary, I should think that would decide it, because that would mean the whole of the boundary. If he wanted you to follow that crooked line he should say parallel to the northerly portion of the east boundary.

Mr. Gibson—It is a mistake in the description.

Mr. Jones—Supposing the description was made before the survey, then you are following the description.

Mr. Shaw—I had a case within the last week something like that. The boundary was crooked, and we had searched the title to make a description of the remaining part of the lot, and the description that was held was "excepting therefrom a square three chains 16 links in the northeast angle of this particular land," but when we searched back further for their title we found the description was parallel to the east boundary, which made a square out of it.

Mr. Gibson—It is a mistake in the description.

The President—Would you mind giving your opinion on this description? I will read the description as I find it. "Commencing at the northeast angle, thence westerly along the north boundary thereof 20 chains, then southerly and parallel to the east limit 20 chains, then east astronomically 20 chains more or less to the east limit, then northerly along the east limit 20 chains more or less, to the place of beginning."

Mr. Gibson—You give an exact description coming along the north part, then you go south a certain distance, then when you go east you say "more or less." What do you say that for? It is because there may be a curve in the line. It is a wrong description. Before they describe, they should employ a surveyor and have surveys made.

The President—As far as the description goes it is all right and properly worded, but what direction is the west boundary of that block?

Mr. Gibson—It is parallel to the east boundary.

The President—Is it parallel to the east boundary throughout its length or just 20 chains?

Mr. Gibson—Supposing the township goes on and opens up a road allowance where would they open it up?

The President—Along the blazed line.

Mr. Gibson—The Council would take possession of that allowance.

The President—The expression in that description "more or less" to the east boundary is not necessary; I take it, from your explanation of this line from here down it is parallel to that line.

Mr. Gibson—It might be. A man when he buys his land must be sure he has got what he asked for. If there is a mistake in the description the surveyor is not responsible. I have refused to make surveys on descriptions of that kind.

Mr. van Nostrand—Section 39 of the Bill that is before us now is as follows: "Every surveyor employed to run any division line between lots, or any line required to run on the same astronomical course as any division line or side line in the concession in which the land to be surveyed lies, shall run such division line or side line on the same astronomical course (which he shall determine by astronomical observation or by other satisfactory method) as the straight line joining the front and rear ends of the governing boundary line of the concession or section, if so intended in the original survey, or at such angle therewith as is stated in the plan and field notes, and the same shall be deemed to be true course of such governing and boundary line for all the purposes of this Act, although such governing or boundary line as marked on the ground is curved or otherwise deviates from a straight course, and if a line is to be run at any angle with a front or other line which is not straight, the ends of such front or other line shall be joined as provided. R.S.O. 1897, C. 181, S. 36. That appears to be the only thing in the Act that bears on it.

The President—Would not that apply to a line the full length of the lot?

Mr. Gibson—The whole original line governs every time.

Mr. Shaw—I think the Act as we have it now is quite clear, that any line drawn parallel or on the same bearing to any original line shall be drawn parallel or on the same bearing as a straight line joining the extreme points of this original line.

The President—It would be well if this matter could be put definitely so that the surveyors would have something decided to guide them.

Mr. van Nostrand—This is new to me but it seems to be very clear from the Statute.

The President—This case is coming up more and more in the description of mining claims.

At 4.30 p.m. the meeting adjourned to meet at 8 o'clock p.m.

The evening was devoted to a paper on Hydro-Electric Development, illustrated by lantern slides by Mr. Charles H. Mitchell, and views of scenes in Northern Ontario by Mr. J. F. Whitson.

Morning Session, Wednesday, March 1st, 1911.

At 10.30 p.m. the President took the chair, and having called the meeting to order, said: Gentlemen, the first thing on the programme this morning is a report of the Committee on Engineering by Mr. Hutcheon.

In the absence of Mr. Hutcheon this was allowed to stand over.

The President—In the absence yesterday of Mr. Wilkie and Mr. Esten, Mr. Burd and Mr. Burwash were appointed Auditors, and I wish now to read the report of the Auditors, it is as follows: "We hereby certify that we have examined the Secretary-Treasurer's vouchers, receipts, financial statement and bank account and find them correct. (Sgd.) N. A. Burwash and J. H. Burd, Auditors."

On motion of Mr. Burwash, seconded by Mr. McKay, the report was adopted.

The President—The next paper is one by Mr. W. A. McLean on "Road Surface Treatment for Dust Laying." Mr. McLean is absent attending a meeting of the Good Roads Association, and I will call upon Mr. Ardagh to read the paper.

Mr. Ardagh then read Mr. McLean's paper, which was received with applause.

The President—The next matter on the programme is the report of the Committee on Drainage to be presented by Mr. George Ross, the chairman.

Mr. Ross then read the report.

Mr. J. H. Moore—Mr. President and gentlemen, members of the Ontario Land Surveyors: As a member of the Drainage Committee and as an engineer from the east that is having his trials and tribulations down there (of course that is past and gone and I am only going to refer to that in connection with any proposed future trouble). A short history of this case will be found in the "Weekly Reporter" of 1909. I prepared a report for the Council. Nobody finds any objection to the auditing of an account. The account went before them and I appealed to the Drainage Referee, knowing how the thing was going, for an order to set the first audit aside. We succeeded in having the first audit set aside and after getting a favorable ruling from the Referee with reference to fees we consented to the Senior Judge of the County of Carleton proceeding with the new audit, which resulted in no very great success. Not being satisfied, with the consent and permission of the Judge, I appealed to the Divisional Court. I knew we were up against this difficulty at the time, that under the appointment of the County Judge as auditor he was appointed not as County Judge but as a person designated by the Act to audit that account, and the doubt was whether there was an appeal from his audit. We came to Toronto before the Divisional Court and the appeal was dismissed without costs. On the facts the Divisional Court found with me but on the law they held that I had no appeal. I requested the solicitor for the Township of March to consent to open it up again before the County Judge, but naturally enough the solicitor refused, so I was down and out.

The question is here, under the County Courts Act the limit of jurisdiction is from $400 to $500. Here was an account which owing to high board bills, expenses of help, etc., ran up to about $3,100 or $3,200, and power was given to the County Judge to cut off certain sums which I couldn't get at all, and on the other hand what he did allow I couldn't get because the Council themselves had no authority to pay me, and while the Judge had held that I

was entitled to so much yet anybody might say, Oh, well, that is all right, that is just the opinion of the County Judge that that much is coming to him, we will fight this thing further and see where we are at, so the County Judge's decision was not a judgment. That is the standing of the Act. The only precedent that my solicitor could find at all was some old English case. The High Courts have held that engineers can delegate certain parts of work of that kind to capable assistants but there are some parts which the engineers must do themselves. My position was this, I had been charging more for the services of my skilled assistant, who was a better draughtsman than I, than I was paying him. I was looking after the legal parts, the more important parts. I had the plans prepared by a better draughtsman than I was and I had been charging more for his services. The Judge held I couldn't charge any more for my men than I was actually paying them. Any gentleman here present will easily see under such a ruling that the owner of the land would say, Mr. So-and-So, this is not your work, you have sent your assistant down. How much are you giving him? And I would have to say, I am not giving him anything, he is only under articles with me. Then he would say, well, you are not entitled to anything for him. That is the principle.

I think after getting a favorable opinion on the facts from the Divisional Court, from Mr. Justice Riddell, that the Act should be amended so that an appeal with reference to an audit shall go direct to the Referee, or that an appeal shall lie from the County Judge's audit to the Drainage Referee or to a High Court Judge. I think that is only in the interests of the profession of each and every one of us; it goes beyond the Ontario Land Surveyors' profession and civil engineers, it goes to others. I can state a case where a doctor was doing business and a brother practising under him but didn't have a license, and the doctor was charging for his brother's services the same as his own. I was fighting the battles of the profession before and I have got a little wiser and I am giving the members the benefit of my experience; there is no uniformity of opinion with our County Judges. I went before the united Counties of Dundas and Glengarry and the question was raised, how much should be paid. The solicitor for the township said you shouldn't charge any more than a certain sum. The Judge asked who got the benefit and the answer was that the Council got the benefit. The result was that the amount was paid and there was no trouble at all. You go into another county and it is just the other way. If our Association can't fix the tariff we want some centralization of authority where the case is reported and where that shall govern these individuals.

With reference to the Ditches and Water Courses Act. There is a good deal of work done under that. The Legislature has increased the cost of work that may be done under that Act to $1,500. There may be five or six people interested in a job of that kind, and perhaps one of those men shares five or six hundred dollars of that amount and he has to put up that five or six hundred dollars, if it is not put up it goes on the collector's roll with 7 per cent. added. I think the Act should be amended in some way so that if it is decided that one man's assessment should reasonably be $150 or $200 there ought to be some way of spreading that over ten or fifteen years because when a man is liable for say $700 and it isn't paid, as I said before, it is put on the collector's roll with 7 per cent added, and the next thing the sheriff comes along to seize whatever he can for taxes. It strikes me by fixing the total cost at $1,500 it extends the jurisdiction of the Court, so that more relief can be granted in quicker time.

I fall in with Mr. Ross's idea that where the costs of a drain exceed $500 the right of appeal should lie from the County Judge to the Drainage Referee. My experience with County Judges is that they do not grasp drainage work; they do not grasp the importance of the fact that it is a public improvement and that as far as possible it should be kept away from little quibbles and little technicalities. It may be that one man is assessed a little more than another—assessment is a matter of opinion. But it is a fact that two engineers who have gone over the ground can smooth down and so on, but it is an injustice to have the thing thrown out holus bolus and set to one side on a legal technicality and thereby put the poor fellow in for all the costs in connection with that. It is like giving a child a razor to play with and the child cuts himself, and who has to pay? It is the fellow that gives the child the razor. You give a farmer that Act and tell him, you go ahead and drain your land, and the first thing he knows he is in for $150 or $200 and costs, no drain, no nothing, and there he goes down and out, and he doesn't want to try it again. So that if an appeal lies from a County Judge to the Drainage Referee the County Judge will go into the matter very carefully. The nature of humanity is to wish to be supreme, and the Judge will say, if there is an appeal against me I will have to go into this thing very carefully. If there is no appeal the temptation is to slip over the thing, but if the County Judge knows that a judgment of his is going to be passed in review by a higher court he will be more careful, but when he knows his judgment is final it is passed on quickly.

On motion of Mr. Jones, seconded by Mr. Moore, the report of the Committee on Drainage was adopted.

The President—I will now call on Mr. Stewart to read his paper on "Lumbering Operations on the Pacific."

The President—There was another paper by Mr. Rorke on "Surveys," but owing to illness Mr. Rorke asked me to state that he would leave the paper with the secretary.

On motion of Mr. Kirkpatrick, seconded by Mr. Moore, Mr. Rorke's paper was taken as read.

One o'clock p.m., adjourned to two o'clock p.m.

AFTERNOON SESSION, 3 P.M.

The President took the chair and called for the report of the Committee on Land Surveying, and in the absence of the Chairman, Mr. Niven, Mr. Beatty said: The understanding is that Mr. Speight will furnish a written report to be embodied in the minutes. The main thing that came before the committee was problems submitted by Mr. Routly. Mr. Routly in his letter states that he encloses a number of questions, all of which are of extreme interest to the members working in his locality.

The first question is as to the aliquot parts of full lots. What steps, if any, are being taken to establish by legislation or otherwise, a uniform method of sub-dividing a full lot into aliquot parts?

A. Under the new Act the new bill going through at this Session, Section 31, covers that question.

2. Question: What method, if any, is endorsed and recommended by the Committee?

A. We endorse that change in the Act. The Committee endorses the Act.

3. Question: When an irregular 40 x 80 chain lot is so poorly surveyed originally that the lines are found to be very crooked and the chainings much in error, is there any law, decision or ruling which determines the method of surveying portions regarded as aliquot parts?

A. The same section, 31, will cover that also.

4. Question: What is the purpose and interpretation of Clause 19?

Mr. Beatty—That refers to the aliquot parts of lots that are not provided for in the new Act. The clause reads "Except as hereinafter provided for," and then the different cases that come up are provided for. If there is nothing that meets the case, you will have to go back to the fractional part of the lot or the aliquot part of the lot. He gives us this problem, here is a case of the section system in which he wants the lot divided into quarters. How would you divide them? How would you subdivide lot 8 into the 8 adequate subdivisions in which it would be recorded as a mining claim?

The new bill that is going through says this line shall be run on the governing line and astronomic bearings from the point midway between these corners. Then when you started to divide into east and west halves you would again divide here equally and you would run this line parallel astronomically to that line. To divide it into north and south halves, you establish points midway the east and west limits and joint these points; and our understanding is that at the point where the trial line will not follow the original line on the ground, where this line intersects that you will plant your post, and that there will be the boundary of that lot, and then, if you want to subdivide again to get the eighth part, you would divide this equally and divide that again, follow the same method right through.

The whole object of the change in the Act is to do away with jogs at the corners and to make the corners of the different aliquot parts coincide.

Mr. Routly says there are terms used frequently in descriptions which cause considerable trouble in connection with shore lines. (1) Determining exactly what they mean. (2) Surveying them on the ground. These terms are "shore line," "shore," "high water line" and "water datum." The committee feel that it is very difficult for them to answer questions on descriptions that are not definitely worded. If the descriptions are not definitely worded, then the people that buy the land or who make the survey and draw up the deed, simply have to put up with it. It is a question of law; it is something you can't provide for or interpret, but the Court will say in certain cases: These terms, "shore line," "shore" and "water's edge" are so indefinite that their use should be avoided. "High water mark," which he refers to as "high water line," is held to mean the line of vegetation and not the extreme flood level. That is, high water mark is not the extreme flood level in the spring at all. There are decisions on that. It is

generally held that high water mark means line of vegetation, where timber ceases to grow. It is a well-defined mark. You can see it on any lake or river you ever travel on. It may vary from one decade to another, but that is a matter that is absolutely beyond anybody's control, and the understanding is if a man buy to high water mark and the high water mark changed he would get to the present high water mark.

There is another problem and it is rather poorly defined here (sketch) because the blackboard is broken, but I will give you it as nearly as I can. Here is a case where the original blazed lines can well be found. It is easily followed on the ground. There is no difficulty in following the original blazed line either on the side line or on the concession line. The field notes state that there is a post planted here at this corner, and give the bearing tree, a six-inch balsam, given in the original field notes as N. 82 east, 10 links. They find on the ground an old post lying down some twenty feet away from the intersection, but by using the field notes which state N. 82 E. 10 links, and by chaining from the bearing tree which is standing and easily found, they come to a position which from the information given here leads us to believe that they are quite satisfied that they have found the spot at which the post was originally planted; there is evidence of the stones lying there and that agrees with the ten links from the bearing tree. There is no blaze on this side line within forty or fifty feet of the concession line, and a blaze down here about twenty feet. Now the committee feel that if you can establish the position in which the post stood originally, you must accept it. The object of our Act is to regard original monuments. If they were wrongly placed we can't help it. There are hundreds of cases that will crop up where if you went to interfere with the original monument you would simply have to survey the whole township; you could never stop short of this.

The committee also feel that in the absence of the position of the original post being accurately determined, you should re-establish from the blazed line.

The information given is that by establishing at the intersection of the blazes the post will be seven links off the line. An awful lot of people think that is very close work. The trouble they find is this, that we can't tell whether he ran from that line, or whether he ran his side lines or concession lines first. As far as the field notes show they do not refer to a blazed line, but they do refer to a post.

Mr. Shaw—Did I understand you to say to run a line between lots 1 and 2 you would chain from the southeast angle on 1 to the southwest angle of 2 and divide equally?

The President—In that case you would.

Mr. Shaw—Wouldn't you take the post?

The President—This is in a case where the post was lost.

Mr. Speight—What Mr. Beatty was discussing was dividing up a lot into aliquot parts, which is now before the Legislature.

Mr. Shaw—It strikes me a line between the north and south half of lot 2, to do it in that way, with the blazed line at the west, it is somewhat cumbrous to change the west boundary of 3 there.

The President—What other way could you do it?

Mr. Shaw—I think I would divide midway between the northwest angle of 2 and the southwest angle of 2 and produce the lines.

The President—That would be giving a preference to the side from which the lot is numbered?

Mr. Shaw—No, it would be producing a line to a boundary.

The President—But when you were dividing here the production of this line east and the production of this line west would not intersect at the same point; you would be giving a preference to the one lot.

Mr. Shaw—I would put the post on the blazed line. Does it not strike you that in that way it means a lot of cutting out?

The President—It does, but it means something definite.

Mr. Shaw—The great trouble I find with the present system is that to run a line according to law means so much work that people are not willing to pay for it.

The President—It is a simplification; under the old Act no two surveyors would adopt the same method of dividing the line into equal parts. I think in this case it is the nearest approach to getting something definite we could possibly arrive at. It may mean a little extra work in chaining the other line.

Mr. Speight—Perhaps it would clear the air if I would read what the new section is in the act. (Reads Section 31, Sub-sections 2 and 3.) It is a pretty hard matter to frame a clause to cover

every individual case, but the Legislation Committee last winter spent much time in revising the Act and this is the result of their deliberations, and we thought it covered the point about the post that seemed to suggest itself to the members of the committee.

Mr. Shaw—It strikes me it would be preferable to have a jog there rather than do the extra amount of work.

The President—I think there is great objection to having a jog on that line, not only from the agricultural standpoint, but also in mining. Too many posts on that line complicate it.

Mr. Speight—It would be more in a mining section where these difficulties would arise and there owners would be prepared to pay for it.

The President—I don't think we should cripple our Act because it causes the running of an extra line. It is one of the complaints that comes from a great many of our members that we have sacrified the interests of the surveyors for the miners and prospectors and farmers.

Mr. Shaw—The simpler it can be made the better.

The President—We might make it a little easier for the public but I don't think it would be as satisfactory.

Mr. Burwash—Would you put a post on that trial line where the line is deflected?

The President—No. You would plant a post on the blazed line. This is a blazed line.

Mr. Burwash—There wouldn't be any other post; the other line wouldn't be there.

The President—This is showing a particular case.

Mr. Burwash—I know, but suppose you used the left-hand line as the original line on the ground, then between north and south halves of 2 you would have a crook in your line and nothing to mark the crook particularly.

The President—No, I think this would be a straight line from a midway point between that point and this, and between this point and that, establishing that by the production.

Mr. Burwash—That would not be the production between the north and south halves in "1."

The President—No.

Mr. Shaw—How would that affect this case, we will say one man owned the south half of 2, and the other man the north half of 2, and a third man the whole of three, and he says to the surveyor, Get out of this, this is my bush. What are you going to do then? Can you go into a man's land where it is not a boundary and cut a line through his bush?

The President—It is not necessary to cut a line through there; you can establish it in some other way. You can measure it along the old blazed line for that matter.

Mr. Shaw—You would have to get the bearing of the north boundary of 3 and the south boundary of 3 to know where to project on that trial line.

The President—Couldn't you traverse along your crooked line?

Mr. Shaw—You would have to get the north and south boundary of 3 to do that.

The President—In any case you would.

Mr. Shaw—Not the way I suggested you wouldn't.

The President—Your idea is to have jogs if necessary?

Mr. Shaw—Yes, to simplify the work as being preferable to such an amount of work.

The President—That point was very clearly threshed out.

Mr. Beatty—Why not go back to the old Act altogether? You can't make a law to cover three cases like that. The presumption of the Act is that the surveys were reasonably accurately performed, and I don't suppose there would be one case in a hundred where a crook in that line would make a bit of difference.

Mr. Gibson—Stick to the Act as it is; it is about as good as you can make it.

Mr. Routly—I would like to have that question of the shore line and the water's edge discussed. Mr. Beatty says the shore line is very definite. I must differ with him there because very often it is not definite; often there is a shallow bay where the water at one time runs in nearly a quarter of a mile further than at another time; and it is very hard to determine what the line of vegetation is. Are you going to stop at standing timbers, willows or black alder or grass? Then again the shore line is very often important, especially in our country. There are often descriptions given as running along the shore line or high water mark as being the boundary of mining claims, and we have been asked to lay

down the limits of one or two of the older claims in Coleman and had to pass them by; I wouldn't touch them at all because I would not undertake to show where the shore line was originally; the timber is all off; I think the sooner we abandon the description altogether the better. I don't like the description "shore line" or "high water line" because no two surveyors would agree exactly. A slight difference of opinion does not make much difference now, but it might make a great deal of difference when a rich vein is found running into the water. I think in making the original surveys if the shore lines were traversed and posted and made definite once for all, it would be much better than the indefinite shape it is in at the present time.

Mr. Beatty—You mean that you would post the high water mark?

Mr. Routly—I think so.

Mr. Beatty—About how many thousand posts would you plant?

Mr. Routly—I would make a number of courses and this original survey would always hold.

Mr. Beatty—A man can't get title in certain places beyond high water mark, and you can't survey that high water mark and put it on the plan.

Mr. Routly—If you can't survey it in the first place, how are you going to survey it in the second place?

Mr. Beatty—Surveyors are not infallible; they can't make surveys that are absolutely correct. They can't survey the water line and put it on the plan.

The President—I think in this matter Mr. Routly is perfectly right, from the experience we have had in the north country in Cobalt; the Department has insisted lately on having a close traverse made of the shore showing off-sets at very short distances. Take for instance on Peterson Lake, which is a rich mining section in Cobalt, there was a rough traverse from sights taken from point to point; very few offsets taken from the shore. In the last four years the Nipissing Company not only cleared off all the shore line, but by hydraulic work have washed off all the dirt, so that what at one time formed a bank is now lowered about six inches to a foot, and the water extends further inland than it did originally In a case of that kind it is absolutely impossible to tell where the original shore line ran; in some cases, for instance in the Crown Reserve, they have lowered the water nine feet to oper-

ate; but I think the principle should be laid down that no description of land, to be of any importance at all, should be given as following the shore line or high water mark or water's edge.

Mr. Moore—If the value of the property is such that extra precautions have been taken to mark out the high water line, why not have your level and resort to a contour line. In the original survey the high water mark is indicated by ice on the trees. Run back from there and take up your contour line and stake that out at regular intervals and plot that on the plan. That is quite easy.

The President—But the fact of taking levels and following your contour line would not answer in the case of Peterson Lake where the soil has been washed away a foot or more back and in some places, half a chain.

Mr. Moore—I mean when you were making your survey for the first time.

The President—Why use the high water mark at all? Why not use a definite traverse line with bearings and distances?

Mr. Moore—By using high water mark the man who buys the property gets to high water mark and then hereafter if for mill purposes the water is raised the party who took out the patent from the Crown has only back to that high water mark and any person that comes on afterwards can keep that high water mark. If it is indefinite it may lead to any quantity of complications hereafter, by the grass slipping down and the man saying, Here is where I bought to; the high water mark has come back and it has destroyed that part of my land and I want damages. The thing is to have it plotted on the plan.

The President—And make no reference to it in the description?

Mr. Moore—Yes, make reference to this high water mark as according to sketch. There are exceptional high water marks above and exceptional high water marks below, but take the average that has been there for years, that has been there so long and permanently that it has indelibly marked itself on the shore ground, on the rock faces or old trees. Anybody who has observed them can see them on the old trees and level across from them. This year it might be three or four inches higher than it has been for ten years. Take the mean average high water mark as marked on the rocks and on the trees; then run a contour line and put in your stakes ten, fifteen or twenty feet apart; it just depends how far back the water mark would run; if it runs in fifty rods in one bay put the measurement and chainage and angle, where it is worth it; if it is simply for beaver meadows or anything of that sort, offset it.

Mr. Gibson—I suppose the idea is to fix what was intended at a certain time. In the Township of Scarboro we put stone monuments back a sufficient distance from the shore so that they would never be washed away. The stakes as suggested would be all washed away sooner or later. High water mark is, down in this country, to the line of vegetation or the line of the shingling on the beach; not any extreme either way, but just the average, and these monuments are marked to fix that boundary. It may change; the lake rises and falls, but the average is shown about what it was at a certain date, and the parties who want to fix that line must make a survey.

The President—They fix the intermediate points by traverse and measurement.

Mr. Gibson—No; so long as you knew what the high water mark was at a certain time the average all round was the same.

The President—Between those monuments there would be one part where the ground was sandy and the other part rock, and there would be more erosion in one part than the other.

Mr. Gibson—Then it is for the Courts to settle.

The President—What we want to do is to get it out of the hands of the Courts.

Mr. Shaw—The question to my mind is, what is the line of vegetation. I have a case to be settled next summer, controlling about two or three hundred acres of land, in which it has to be settled whether it is or is not an island. The question is, what is water grass and what is land grass, because you will find water grass where you are running a canoe through there till September sometimes.

Mr. Gibson—The parties won't take the decision of the surveyor; they want the decision of the Court.

The President—Mr. Beatty, do you consider muskeg vegetation? Is that part of the bed of the lake?

Mr. Beatty—No. I think there is no doubt there are cases where you have great difficulty in determining what high water mark is, but I don't think we can frame any description that will cover it. I think you have got to arbitrate to settle.

The President—Don't you think it would be better to describe the shore lines by metes and bounds?

Mr. Beatty—No, I think high water mark, and let them fight it out. The Government instructs us in all our surveys that we are to plant posts at high water mark; the road allowance must run

along high water mark. Let the Government appoint a Royal Commission to decide what this thing is. We can't authoritatively decide it.

The President—If your lot is shown on the plan with the traverse line on it and metes and bounds given, that will fix the boundaries of the lot, and have no reference at all explaining the high water or low water or water's edge.

Mr. Beatty—No, but as I understand, the Government retain in a good many cases land covered by water. One man is allowed to take up to high water mark, and they will reserve islands or islets in certain lakes; it will be up to them to determine where high water mark is.

Mr. Davis—I think there is a great deal of force in what Mr. Beatty says. High water mark has been the old established basis in both engineering and surveying for all the years in the past, and if I remember correctly the high water mark governs in all cases of riparian rights, and if you depart now from that old basis which we have all used all our lives, the high water mark, it may be a little indefinite, and would have to be decided by the Courts in particular cases, but generally will not the old basis that we have used—the high water mark—apply and help us out in the generality of cases? I think we ought to adhere to the old practice.

The President—Take it in Lake Erie, the rise and fall in the last 25 years is more than two feet. Now take the high water mark to-day and 25 years ago, and where does it land you?

Mr. Davis—That is true; high water mark is changing from decade to decade.

The President—If the high water mark was a permanent mark I think it would be a first-class thing to abide by, but where it is changing from year to year, because they used it in the past I don't think is any reason why we should follow it in the future.

Mr. Davis—It changes from decade to decade, and if we adhere to a certain high water mark to-day, we probably can adhere to that for several years, and then let someone else determine according to the circumstances in the future; but it seems to me we will get into endless trouble if we depart from the old system.

Mr. Gibson—What words would you use instead of "high water mark"?

Mr. Shaw—I don't know of any better words for farm lands, but for mining lands it is another thing. In mining claims there might be a traverse run and a patent taken out to that traverse line.

The President—I think that is right. That would apply to farm lands just as well. I don't mean to say it should be made retroactive, but it should apply in the future.

Mr. Speight—Another way to fix the water line would be to have a certain contour so many feet above sea level. That could be made fairly permanent, so that the line could be reproduced again, having a fixed line suggested by Mr. Whitson and Mr. Routly, and show the line, making an accurate traverse of it. You mention Lake Erie, where the shore line accretions are very considerable in certain parts, and in other parts there is a very great erosion. Would the title to the land go beyond the fixed traverse line?

The President—In that case if the lot was described as land and land covered by water, it would. It is not necessary in granting a patent that the Department should only grant dry land; if the description read land and land covered by water within the limits of the certain area, those limits would never change.

Mr. Shaw—We had a case at North Bay in which the town lots went apparently, on the plan, to the water's edge of the creek. After a number of years that has changed. I found in that case in making some more town subdivisions the course adopted was to run your lot line to the centre of the creek, running extra traverse lines from corner to corner of the lot.

Mr. Gibson—Look at the cases decided on that matter.

The President—There is a case decided by Judge Mabee on Lake Ontario with reference to the removal of gravel from the front of a lot; but it is pretty hard after reading his decision to settle what should be done.

The President—I will now call on Mr. Ardagh to read his paper on "Stadia Survey in Georgian Bay, District of Parry Sound."

Mr. Ardagh—I brought some samples of field notes down to illustrate this short paper. You can see the form of survey by looking at this.

Mr. Ardagh then read his paper, which was received with applause.

Mr. Kirkpatrick moved, seconded by Mr. Sewell, that Mr. Ardagh's paper be received and printed in the forthcoming volume of proceedings. Carried.

The President called on Mr. James Hutcheon to present the report of the Committee on Engineering.

Mr. Hutcheon—I am sorry to say I have not been able to get a meeting of my committee. However, I have prepared a short report, which I will read to you.

The President—We will now ask Mr. Kirkpatrick to read the report of the Committee on Legislation.

Mr. Kirkpatrick—Like Mr. Hutcheon, I looked in vain for the committee; I couldn't find anyone, so I had to prepare a short report and give a synopsis of the Acts as they are going through the House at the present time. I thought that was the only thing we had, because there was nothing in the legislation that we had before the House that would interest the members.

Mr. Kirkpatrick then read the report of the Committee on Legislation and moved its adoption.

Mr. Fullerton—Before this report goes through I would like to make a suggestion regarding Section 27 of this new Act. Section 27 is the clause which reads as follows: "A person who has attained the age of 21 years and has practised as a land surveyor in any of His Majesty's Dominions other than Canada, and satisfied the Board that the qualifications for practising required in such Dominion were similar to those required in Ontario, and produces to the Board his diploma or certificate, shall not be required to serve as an apprentice, or shall only be required to serve during such period, not exceeding three years, as the Board may deem requisite, after which he shall, on complying with the other requirements of the Act, have the right to undergo the final examination, or such parts thereof as the Board may deem necessary, and if found qualified, shall be admitted to practise. R.S.O. 1897, c. 180, s. 27." I would like to have the addition of this clause: "provided also that the Board in such above mentioned Dominions shall grant the same privileges to qualified land surveyors of this Province." That clause will not have any effect on any of the Provinces of this Dominion, nor will it affect Dominion Land Surveyors that grant us those privileges, except the Province of Quebec. I had occasion to write for the Act of the Province of Quebec, and the clause in that Act which refers to other surveyors is this: "Every person admitted as a land surveyor of the Dominion of Canada or of any of the Provinces of the Dominion other than that of Quebec, in which there is a Board lawfully authorized for the admission of land surveyors, and who holds a diploma from such Board, is obliged to serve under written indenture for twelve consecutive months, and to prove he has had three months' practice in

the field in the Province of Quebec, after which he may undergo the examination prescribed by this section on complying with all the other provisions of the same." That is one Province which discriminates against this and every other Province of the Dominion, and I think no harm can come of it if we added that clause which I suggest to Section 27.

Mr. Speight—That is a good suggestion. We should treat them in the same way they treat us.

Mr. Kirkpatrick—I might say that formerly we had reciprocity with Quebec, providing that six months was served in either Province. The Quebec surveyor could become an Ontario Land Surveyor by serving six months, and an Ontario Land Surveyor could become a Quebec Surveyor in the same way, and I think in 20 years Alex. Russell, of Port Arthur, was the only surveyor that availed himself of it, so I don't think there is much trouble about reciprocity between Quebec and Ontario. Then the Quebec Board withdrew that and of course we had to follow suit. Quebec is in exactly the same position as the other Provinces are; they have to serve one year and satisfy the Board in this Province. The same way as to the Dominion surveyors; we had reciprocity with them. You all know perfectly well that as far as the scientific part, the mathematical part of the examination, it is exactly the same, but our examination is much severer, as Dominion Land Surveyors who have come up to pass tell us. Why? Simply because our examination has a lot of practical things that the examination of the Dominion Land Surveyors has not got. We have a whole lot of practical things. Why do we put them in? It is not to harass the surveyors, it is to make them better men, and I believe they all appreciate it, too, that is my opinion.

Mr. Routly—If Mr. Fullerton will put that suggestion in the form of a motion, I will have much pleasure in seconding it. There are mining fields opening up on the Quebec side away north, and frequently Ontario Land Surveyors residing there are being asked to go into Quebec and make surveys, which they are not able to do, and for some time I had considered myself able, if possible, by passing their examination; but you see it is necessary according to their ruling that we should serve a year's apprenticeship with a Quebec Land Surveyor and serve three months in the field. We don't ask that of them, and probably if we insert this clause, making it applicable to Quebec, when they reciprocate, they will withdraw that one year's apprenticeship.

The President—Could there be any possible objection to Mr. Fullerton's clause, taking it from the Board of Examiners' point of view? Why should they be allowed to practise in our Province

on more reasonable terms than we are in theirs. They ask us to serve a year's apprenticeship.

Mr. Kirkpatrick—The Quebec people coming up here have to serve a year.

The Secretary—No; the Quebec surveyor has oeen allowed to pass our final examination on presenting his Quebec certificate.

Mr. Kirkpatrick—I thought it was by serving as much time as the Board requires.

The Secretary—That is true, but we didn't require him to serve at all; we allowed him to pass the final examination.

Mr. Kirkpatrick—It says he "shall not be required to serve as an apprentice, or shall only be required to serve during such period, not exceeding three years, as the Board may deem requisite." That is what has always been done; that is the same way with all surveyors, no matter what they are, whether English, Irish or Scotch or anybody else, if they are entitled to practise in any of His Majesty's Dominions other than Ontario. The Quebec men are exactly on the same status as that. They can not go up for examination until they have satisfied the Board that they have asked the Board's permission how much time they have to serve. That is, they come with their qualifications before the Board; the Board will take that into consideration and will tell them they can serve one year, six months or three months, as the case may require, after which they shall come up for examination. I think the Act is plain.

The President—In the one case it is compulsory. The Quebec Board of Examiners have not got the option of passing you without serving the term.

Mr. Kirkpatrick—I know, but I think this Province ought to be a little generous to the older Province, as far as I can see.

Mr. Fullerton—This thing depends on the Board; the Board has power to exact a year's apprenticeship, but with the addition of this clause in the Act, "Provided also that the Boards in such above mentioned Dominions shall grant the same privileges to qualified land surveyors of this Province," then you would have no authority to allow the surveyor of the Province of Quebec to write on this examination without undergoing the year. At the present time they have authority. The Board can admit surveyors from the Province of Quebec that they think are sufficiently qualified, but with the addition of this clause then the Board is bound to make them serve a year. I believe the adoption of the report has

been moved, and I would second the adoption of the report with the addition of this clause.

The President—Supposing we let this report stand over for about 15 minutes. There are several other things on the programme for this afternoon. There is a paper by Mr. Fawcett on "Geodetic Surveys." I understand Mr. Fawcett hasn't sent in his paper yet; he has informed the Secretary it will be forwarded.

Mr. Kirkpatrick—I have no objection to Mr. Fullerton's amendment going into this report on legislation. The only thing I am afraid of is that if we went up at the moment of the third reading they might throw the whole Act out. But it might come up another year, when some of the other items which some of the other surveyors who have been looking through the Act have put before us, could be taken up also.

The President—There are two or three points with reference to the amendments in connection with the report of the Committee on Surveying that are rather important, and I think we might add that these changes be made at the same time, if you thought well to have that one made.

Mr. Kirkpatrick—Yes, but I wouldn't ask it this year.

The President put the motion to adopt the report, which was carried.

Mr. Wilkie—I would like to go back to Mr. Hutcheon's report and I would move that Mr. Hutcheon's report be accepted, but I would like to say a word covering one point which he has raised, and that is with reference to the grades on the C.P.R. in the mountains. I happened to be on the survey of the original trial lines, on the first location of that grade, running the transit. Mr. Hutcheon says the grade was four per cent., but our instructions were, and we worked to a 4½ per cent. grade which was compensated for by curvature. I may be in error as to this, but my recollection, from the report I have seen, is that they changed the grade. The basis on which they worked was 2.2 per cent., which is compensated for by curvature, which reduces it somewhat below that actual grade. The work was very interesting, working to an unusual grade, and the contractors, old men who had been in business for years, were thunderstruck when they found what they were doing; and I think it is known the C.P.R. operated it successfully for a number of years, and finally reduced it, finding it very heavy for operation. I think this report should be accepted and printed in the minutes. (Adopted).

The President—The next paper is one by R. W. DeMorest on "Magnetic Surveys in Locating Ore Bodies." Mr. DeMorest informed me that, having been called away from Sudbury on some work, he was unable to complete his paper, but would send it to the Secretary in time to have it printed. I think this will be a very important paper, as Mr. DeMorest is probably one of the best informed men on magnetic surveys in locating ore bodies in that northern country. He has been for several years with the Canadian Copper Company in locating nickel ore, and has made a special study of it. I would ask that this paper be accepted and permission given to have it printed in the report.

On motion of Mr. Sewell, Mr. DeMorest's paper was accepted as read, and to be printed in the Proceedings.

The President—The next paper is one by Mr. L. V. Rorke, on "Surveys." I have the same request to make in connection with this paper. Mr. Rorke is ill and unable to be here himself, although he has the paper written. I ask that this paper be accepted.

I can hardly make the same excuse for Mr. Fullerton. He has handed me the paper, and if he has not left the room I will ask him to outline it. This is a paper on "Future Prospects of Ontario Land Surveyors in the Mining Districts of New Ontario."

Mr. Fullerton—As there has been a lot of business on, and a lot more to come, and as this paper I have written is of no great interest and very poorly written, I don't think it would hold the attention of the people here when there are more interesting questions, and I would move that this paper be taken as read. I wouldn't care to take up any more time.

On the motion being seconded, the paper was accepted and ordered to be printed in the Proceedings.

The President—The next is a paper by Mr. Speight entitled, "Advantage of System in Extending Cities."

Mr. Speight outlined his paper and stated that he would have it ready in time to be printed in the Annual Proceedings.

Mr. Hutcheon moved, duly seconded, that Mr. Speight's paper be accepted as read and printed in the Proceedings. Carried.

The President—The next on the programme is the report of the Committee on Repository and Biography, by Mr. H. L. Esten. I understand Mr. Esten is out of town, and I move that this report be received and adopted. Carried.

The President—I think the only other paper is "Extracts from Archaic Records in the Survey Branch." It is a paper by myself and I have not got these extracts with me. But if they will be accepted later on and may be handed to the Secretary, I will be greatly obliged.

Mr. van Nostrand moved, seconded by Mr. Routly, that Mr. Whitson's paper be taken as read and published in the Proceedings. Carried.

4.30 p.m. meeting adjourned, to meet Thursday, March 2nd, at 10.30 a.m.

At eight o'clock p.m. the annual banquet of the Association was held and proved a great success.

THURSDAY, MARCH 2ND, 1911, 10.30 A.M.

The President called the meeting to order and said: The first thing on the programme is the report of the Committee on Polar Research, by Mr. Chipman. We will pass over that for the present, as Mr. Chipman is not here.

The next is the report of the Committee on Entertainment, which is not yet completed.

Mr. Dickson—If there is nothing before the Chair, I have a resolution to submit which I think will meet with the approval of the whole Association, both those present and those absent, and it should be received with a standing silent vote. It is now 20 years since this Association was formed and incorporated, and year by year we find some faces missing. Death has stepped in, removing someone, sometimes one, or two, or more, but the toll has been heavier this last year than heretofore. I think some eight or nine were called across the river since the last Annual Meeting. We very much regret the loss of these members. I feel in an especial manner the loss of our late President, Mr. Selby, on account of his tragic death. He left home in the spring, to encounter all the hardships incident to Government surveys, in order to provide means for the support of his family. He was in just that period of life when we are supposed to be both mentally and physically

at our best, and no doubt he looked forward with a great deal of pleasurable anticipation to his return home to his family in the fall. He was cut off without a moment's notice. It is very hard for us to look at our friends dying in bed, but to be cut off by such an accident as he met with is peculiarly hard and a great sorrow to his family. I have therefore to submit, seconded by my friend Mr. van Nostrand, the following resolution: "Whereas it has pleased Almighty God during the past season," etc. (Fill in resolution).

The President—Gentlemen, you have heard the motion moved by Mr. Dickson, seconded by Mr. van Nostrand. I think Mr. Selby's early death particularly is a very sad loss to this Association, as he was one who has taken a great deal of interest in this Association, as also Mr. Bolton and others did. What is your pleasure?

The motion was carried, the members standing.

The President—The meeting is open now for any one who has any new business to bring up.

Mr. Chase—I would like to bring up the question of the ballot. I think last year I was furnished by the Acting Secretary with the total number of votes cast for members of the Council. I think there were about 243 active members in good standing at that time, and just a little over one-third of the total membership voted for members of the Council. I would like to hear some discussion on bringing more members into the voting list, and getting the members at large throughout the country to take more interest in voting for members of the Council. The surveyor who is not able to be here receives the list of those nominated for the Council, and if any particular man is put up for any reason to carry forward the interests of any particular class of surveyors, the voter does not know for what reason he was put up; he does not know anything about the discussions that have gone on in the meetings, and he sees the list as it comes in and possibly votes for the man who is senior or has been in the Association the longest time.

Mr. Gibson—Mr. Chairman, before a member can vote for the Council or anything else he has to pay his fees. That may be the reason for so many falling off, but they pay their fees afterwards and get ready for the next time. A person should always exercise his franchise.

Mr. Dickson—I had fully intended to vote last year, but I didn't do so till just about the last day. And on looking over the

papers one day I found my name was under a cloud, and that diverted my attention from the object and I felt when my name was under a cloud, if I couldn't reclaim myself from that, it was going to be a disgrace to the whole profession. However, I was able to reclaim myself. That is the reason why I didn't vote last year.

Mr. Chase—If any surveyor is put up for any particular purpose, for any interest to better any particular class, these surveyors do not know for what reason he was put up or nominated, and I was going to suggest, if it wouldn't be too much expense, that a draught copy of the discussion at this time be forwarded with the ballot paper.

The President—Wouldn't it be a mistake if the Association drifted into that channel, if anyone was elected to represent any particular section and not surveyors as a body. I have been Scrutineer for several years, and my recollection is that very few men who went to the trouble of casting their vote were debarred from doing so for not paying their fees; and speaking for myself, I would very much dislike to see the Association drift into that particular line where men from one section of the country were selected to support the interests of that particular section. I think we should have sufficient interest in this Association as a whole to vote for the men who will best serve the interests of the whole Association.

Mr. Chase—Quite so. I didn't advocate the party system or anything of that description, but I just meant the surveyors who were unable to come to this meeting don't know anything about the discussions that are brought up, and consequently in voting have only the choice of looking over the names and probably voting for senior members.

The President—I think if the members were allowed to vote before their fees were paid, we would require an Assistant Secretary. I think under the present system it is an awful burden for the Secretary to get the fees in. People seem to neglect them or not think they are worth paying.

Mr. Gibson—If the fees were lower it would be worse than ever.

The Secretary—This year particularly I regret to say that when I wrote to gentlemen, they did not answer my letters when they owed three or four years' fees, but if I send them a lawyer's

letter they pay at once. We had to prosecute one member last year who hadn't paid for 13 years.

Mr. Davis—Why not simplify the matter, Mr. President, by allowing the Secretary to ask the Solicitor to collect the fees?

The President—I don't think that would be a very good idea. Many surveyors who just through negligence don't pay their fees, would not like to get a dun from a solicitor.

Mr. van Nostrand—I may say I am quite in accord with the views of the gentlemen who introduced this subject. I think it is quite possible that different sections of the Province will have grievances or matters of great importance to themselves that the rest of the members know nothing of. If they want to have a representative on the Council, it seems to me it would be a very easy matter for them to organize, in the way things are done now, and put in a representative, because my experience of voting is that the average member is quite content to let things drift along; he knows whoever is up there is probably a good man, and it is a toss up with him as to whose name he puts on his ballot, if he takes the trouble to do it at all, and therefore it seems now each section has its opportunity to have its representative. I was very glad to see those working in the mining country last year had taken that view and have a good representative now who can bring forcibly before the Council the needs of that district.

As regards the payment of fees, the amount is so small compared with what one pays for membership in other organizations nowadays, that I don't think it debars anyone; it is more that it is overlooked; but the fact remains that it is overlooked too frequently, and the Secretary's notice includes a notice that the fees must be paid, and I think as a rule that notifications to each member, if he happens to be in arrears, should be sent, so that anyone who cares to keep himself in good standing has plenty of opportunity to do so. I have heard it suggested that it might be well, in view of the fact that the treasury is in good condition and we don't see any immediate need for any drain on it, that the fees be reduced. I had that view myself for some years. I expected when we got in a strong financial position we would reduce those fees, but I don't think a dollar a year more or less makes much difference to any member, and it is better to have the Council in a strong position, so that if anything comes up which requires capital, we have capital to meet it. In the meantime it is drawing interest in the savings account, and if the Council see fit, it may be invested in any other safe way to produce a better revenue. The Statute, I believe, sets forth the methods that are sanctioned for

the investment of funds. But I would urge on anyone who happens to be within earshot and in arrears the necessity of paying fees and keeping himself in good standing. It reflects on a man when his name appears in the register year after year, with one, two or three years' arrears. The Secretary does not want to call in the services of a solicitor; it is unpleasant business, but it is very effective, and I think it should be used rather more frequently in certain cases.

Mr. Davis—To me it seems there are just two ways of accomplishing this purpose, the first is not by reducing the amount of fees, but rather increasing them. If they won't pay their fees when they are $4, make them $8 and they will pay them much more readily. That is a fact. Don't reduce your fees; keep your fees up to the level they are. You can use the money for some good purpose. You will find something developing before long that you will need this money for.

The President—We will soon require some rooms.

Mr. Davis—I suggest you acquire better quarters for the Association, and after participating in the hospitality of the Engineers' Club we have had a taste of what real living is in the clubs of the city, and perhaps we will want something similar to it. The other way is, and it is really the important one, that a man's practice should cease if he has not paid his fees, and I think the Secretary of this Association should have the power to notify any man who is in arrears.

Mr. Dickson—Six months?

Mr. Davis—I wouldn't make it six months, Mr. Dickson. It is unfortunate that the fee year does not correspond with the meeting of this Association. The fees ought to be paid on or before the meeting of the Association, but I see the year starts on the first of April. I wouldn't allow more than 30 days. The less time you make it intervening, the more readily they will respond, and I think every member of this Association, if he can't pay his small amount of $4 within 30 days of the time it is due he ought to be suspended, and while I would not move that such drastic action should be taken, yet I think it is something that should be held in reserve, because there is no necessity that the Secretary of this Association, with his multifarious duties, which we all know he has, should have the unpleasant task of writing to friends, men he regards as his personal friends that he has met here, to pay the small fee which they know is due. It is a shame and a disgrace to me or to any member of this Association to oblige the Secretary, a

gentleman that everybody has unqualified respect for, to write him a dun for fees that are legally due.

Mr. Chase—Isn't it a fact that according to the Act a surveyor is not in good standing if his fees are not paid?

The President—Yes, I know, and in the Department, if a survey comes in from a surveyor who is in arrears, his surveys are rejected in every case, and that has in itself been the means of making several of the delinquents toe the mark. I don't know anyone who has practised for years in legal practice who has not paid his fees, but in our case we have no successful way of forcing payment, except through our Solicitor. Plans seldom reach the Department where they have to be attached to legal documents and could be rejected, but no survey comes into our Department that is accepted where the fees are known not to be paid.

Mr. Chase—Outside the question of fees, my idea was just that these surveyors who were not able to come to the meeting and do not know what has gone on, and only get the report of the meeting after they have cast their votes, should know the merits of the men who are proposed for the Council.

The President—I think there are dozens of members who take the greatest interest in the Association, who would not under any consideration accept office, and whose knowledge and judgment on many things that come up is the very best; men who work on committees and spend their time in that way; we have no knowledge at all through our reports as to what they do.

Mr. O. Jones—Would it not be a very good rule to allow them a certain length of time in which to pay their fees, and then if they have not paid their fees in that time, to hand it in to the solicitor? That is, have a specified time, and not make fish of one and flesh of the other; for instance, if they have been in arrears for two years, let every surveyor know that; that it would be handed into the solicitor's hands for collection if they were one or two years in arrears, or whatever time you think most advisable, and let every surveyor know that who belongs to the Association, so that they could not feel that they were being dealt with more severely than any of the others.

Mr. Dickson—I think there should be some steps taken to let the Registrars of the Courts know when a man is a licensed surveyor and when he is not. Some years ago I was interested in a

suit down in the County of Peterboro, and the surveyor opposed to me was in arrears several years and had no right to practise at all; he simply wouldn't pay at all, because he thought it was an outrage to ask him to do it. I had my client post his counsel that he had better bring up the question that this man was not a licensed surveyor at all when he hadn't paid his fees, but the Judge ruled he was just as capable of performing the duties as anybody. There ought to be something done whereby they would know who was entitled to practise and who was not.

Mr. Davis—Publish a list each year of those entitled.

Mr. Dickson—I think a list of qualified surveyors should be sent on a certain date to the Registrars, and they should not receive a plan prepared by any other surveyor.

Mr. Shaw—Could not a list of members have at the end of each man's name the date when he had paid up to. I think the time ought to be 60 days.

Mr. Sewell—I think it would be a good thing if you were to make it a hard and fast rule that the name of every man over twelve months in arrears should be taken out of the general list and placed in an intermediate list, so that if any case came up in Court and they wanted to object to his evidence, all you have got to do is produce one of these lists of those suspended, then they have to settle their fees before they can practise. It is only the Registry Office and the Courts that do not know. The Department would stop them at once; they would refuse to take their plans.

Mr. van Nostrand—I don't think the Council has ever asked the Court to consider that part of the Act relating to those who were authorized to practise after they have once become registered and have not withdrawn. I think we have allowed that to rest where it stands, and we have the means for collecting these fees; they are due the Association as an ordinary debt, and there are very few surveyors who are not worth the amount of their arrears plus low costs, if we chose to press the matter; and it seems to me it has come to a point when the few who are deliberately allowing their fees to become in arrears should be dealt with through the solicitor, and the others who have not fallen so far in arrears ought to wake up and put themselves in good standing. But to strike a man off the list because he hasn't paid his dues up to a certain date, is, I should think, perhaps going against the old saying of letting sleeping dogs lie. I think we have the machinery now

for getting the fees, and if we make use of it we can get what we require. But, at the same time, while I am speaking about fees, I think the question of quarters for the Secretary and a home for the Association was discussed here. I was not present when it was discussed, but there is no doubt the time has come when the Secretary should have a place. We have a good many books, or had, at the Parliament Buildings, and they have been exposed to the gaze of covetous people who are in the habit of looking at public properties, and I don't know that we have as many books now as we once had. We should surely take charge of those things, because there are some books there that could not be replaced; money would not replace them. The time will come when we must have quarters for the Secretary, in which he can file all the books and records and blank forms that he has and have everything to his hand, and his work will be very much facilitated and the Association be much better served. I would suggest that the Council take it up at its next meeting and act upon the instructions of the Association, and in the meantime the Secretary might look about and see what rooms he would recommend to the Council for their selection.

The President—Would that require to be dealt with by the Association as a whole, or by the Council? Because I may say that our rooms in the Parliament Buildings are no longer available, they are being occupied for other purposes, for draughting rooms, and the old repository is now open to the public, and many of the old records or books the surveyors have been good enough to leave to the Association are being scattered around, and I doubt to-day if we could collect two-thirds of them. There are some very valuable instruments up there, one in particular, a sextant given to the Association by Mr. Jennings; it is still there, and there are many covetous eyes looking at it, and it may disappear at any time. There is no possibility of getting accommodation up in the Crown Lands Department for the records of our Association. I think immediate action should be taken and authority given to the Secretary to secure suitable quarters at once. If we are left in the position we are now in, we will be begging from year to year for rooms to meet in. I believe the engineers would be very glad to give us a hand, but I don't think we should be dependent upon them; I don't think we should ask of them again for the favor they are giving to us this year.

Mr. Watson—I think, with reference to any action taken in the matter of quarters, the Secretary might look into it in the first place, but it should be passed upon by the Council or some committee.

The President—I think we should pass on it now and give the Secretary authority to make a selection, because the selection must be made before the next special meeting.

Mr. van Nostrand—In the matter of quarters my idea is that what we need is space for the Secretary and for the property of the Association; that for meetings like this we could not be better served than renting a hall of this kind here or elsewhere three days in each year, and in the meantime a suitable and convenient office for the Secretary is a necessity. We have been holding onto the Department for years now simply by the grace of the Minister of Public Works, and we must cut that painter at once. The Council could probably take action without asking the opinion of the Association in administering the funds of the Association, but if the Association now in session will instruct the Council to secure a suitable room, then the Secretary, I have no doubt, will take the matter up and be able to report to the Council at its meeting in April and then definite action can be taken by the Council.

I would move that the Council be requested to take action at this next meeting for acquiring a fixed office for the Secretary, apart from the Parliament Buildings.

Mr. Davis—I second the motion.

The President put the motion, which, a vote having been taken, was declared carried.

Mr. Dickson—There is another matter, I think, that ought to be discussed by this Association, that is, to put a stop to any person drawing deeds for the aliquot part of a lot, unless there is an actual survey of that made and a description made by a duly authorized surveyor. That is being done every day in the week. One of the most important things in the deed is to have a proper description. Last year I had occasion to lay off a summer resort, and there had been deeds passing there for ten or twelve years and I couldn't make a survey to agree with all those deeds; they were drawn by half a dozen different parties. When I ran the lines one would clash into the other, and there was the "Old Harry" to pay amongst them. I said to the man for whom I was making the survey, You must do one of two things; those parties must deed the land back to you or give a quit claim deed. I think some steps should be taken prohibiting any person from drawing a deed unless there is a proper description made by a surveyor, and prohibiting the Registrar from receiving such a deed until there is such a thing attached to it.

Mr. Speight—I think this would be rather a drastic measure for a surveyor to take to acquire the sole right to draw descriptions. In a great many cases it is part of his duty to get the data to write the description, but we would have the legal profession after us if we tried to get the exclusive right to draw the description. I think in many cases the experienced lawyer could write a better description than many of the surveyors.

The President—The Land Titles Office and the Local Master of Titles guard themselves against bad descriptions. There is a fee that is paid, one-quarter of one per cent. of the value of the property is placed on deposit to guard against any errors in descriptions. If there is any doubt at all they have a surveyor's plan filed.

Mr. Speight—No doubt the legal profession, more and more, especially the firms of high standing, leave it exclusively to the surveyor to write the description, but I think we might get into trouble if we tried to get the exclusive right to do so.

Mr. S. B. Code—I think that is an important point about descriptions which Mr. Dickson brought up. In the town of Smith's Falls there is a single block which has not been subdivided and the owner has been selling lots off it described by metes and bounds, until now it is almost impossible to make a subdivision. I attempted one two years ago. I filed a plan and it was sent back. I made some changes and sent it up to the Registrar again and it was sent back, and I finally found that the actual distance on the ground from the street from which the description had been made didn't compare with the distance in one of the descriptions by metes and bounds, and he wouldn't register the plan until a new deed was given for one of those properties. The trouble was in this case that the description was drawn up by a medical doctor who was doing the work for the owner.

Mr. Dickson—I had occasion several years ago to compile plans of a certain village; I had made surveys for three different parties and I filed plans on the whole of them, but the Registrar ordered a compiled plan to be made of the whole thing. In the meantime another party who was not a surveyor, who happened by some means or other to inherit an instrument, had been surveying for the people. I suppose he could tell north from south, but whether his chain or compass was in adjustment he knew nothing at all about, and he had some dozen deeds there, and I had to make a re-survey. I didn't feel I could go and throw those pieces of property on the plan, surveyed by a party who I knew was not a sur-

veyor. I found they were all mixed up; couldn't make any sense out of them, and the only thing I could do was get the parties together. I said, Come with me, the whole of you, and show me where the posts are and I will make the survey to suit them. I did so. It cost those people a lot of money.

Mr. Gibson—That is just it. The lawyers themselves have tried making plans of towns and villages, and it is almost impossible to plot them. The only way is, when a man sells, get him to go on the ground and show you what property he owns. The lawyers get the benefit of it in the end. You will get yourself in hot water by inserting that the surveyor draw the description; the lawyer wants to do that sometimes.

The President—I suppose the unfortunate part of it is there are fewer surveyors in the House than lawyers.

Mr. Gibson—That is just it. The lawyers themselves have tried to get a bill through of late years to compel all parties who want deeds made to have them drawn by a solicitor, because there are any amount of deeds made by Tom, Dick and Harry. When deeds such as that come before me as a surveyor, I say, I can't survey that unless you give your written consent to it and instruct the surveyor so and so. You don't control these things unless you get reciprocity and get all the parties together to agree to something definite.

Mr. Speight—There is another matter that should be brought before the Association. There are two bills before the Legislature now that are of more or less interest to the surveyor, and I think both of them are pretty much on the same lines. Doubtless most of you have seen the report in the papers of one bill brought in and fathered by W. D. McPherson, the member for West Toronto. It gives cities over 50,000 population the right to have control over streets two or three miles beyond the city limits, and all plans to be submitted to the Ontario Railway Board for their approval, so that the cities can have some control over projecting streets out in the newer parts adjoining the city. I enquired this morning and I found the bill is not printed yet. But it is somewhat on these lines they are seeking legislation. I think it is certainly right. We have had some amendments to the Registry Act during the last few years, giving the cities a certain control; plans have to be submitted to them, and I think it would be in the interests of our profession generally to support them after we get copies of the bills.

Mr. Hutcheon moved, seconded by Mr. Wilkie, that, in recognition of his services during the past year, the Association grant the Secretary-Treasurer the sum of $350. This, I may say, is an advance of $25 over last year, but I think the increased amount of work and the efficiency of the Secretary more than warrants it.

Mr. Dickson—I think the time has arrived when it should not be necessary to have a motion every year. I think we might as well fix his salary at once and be done with it. I therefore move that the Secretary's fees each year be fixed at that sum.

The President—Isn't the work of the Association increasing each year?

Mr. Dickson—If it is, increase the fees; in the meantime make it a permanent thing.

Mr. Wilkie—As seconder of that motion, I feel the work has been increasing from year to year, and that the matter has been going fairly well without causing much trouble by making a grant each year at the annual session for the services performed, and if, as Mr. Dickson says, the work is likely to increase and we would have to have a motion to increase the salary from year to year, it is only continuing what we are doing, and the fact of attempting to make it permanent is only a makeshift, because we would have to do it next year or the year after. When I seconded this motion I felt it was doing the best thing we could do, for the present at least.

Mr. Dickson—I withdraw my amendment.

Mr. Gibson—I think it is very low compensation to the Secretary, considering the way the work is increasing. If we get our offices we will have to keep up in state, and I think he will require a considerable increase in salary.

The President put the motion, which on a vote being taken was declared carried.

On motion of Mr. Davis, the meeting adjourned for 15 minutes.

After recess.

ELECTION OF OFFICERS.

Mr. Speight—Mr. President and gentlemen, I am sure I voice the sentiments of the members here in proposing the name of our friend Mr. Whitson to continue as President for another year.

Mr. Dickson—I have pleasure in seconding that motion.

The motion was put to the meeting and adopted, and Mr. Whitson declared elected to the office of President for the ensuing year.

Mr. Whitson—This is against my wishes altogether. I would a hundred times sooner leave it to some abler man.

Mr. Davis—It is all settled, sir.

I move, seconded by Mr. Code, that Mr. Speight be Vice-President for the ensuing year. Carried.

Mr. Speight—I thank you for this honor. I would much prefer that some other member had been appointed, but I will do the best I can.

The President called for nominations for the election of two members for the Council.

Mr. Sewell—I move that Mr. Kirkpatrick be re-elected.

Mr. Chase—I move, seconded by Mr. Routly, that Mr. Watson be re-elected a member of the Council.

Mr. van Nostrand—I have pleasure in moving, seconded by Mr. Dickson, that Mr. Blair be a candidate for the office.

Mr. A. S. Code—I would move that Mr. Dobie also be a candidate for this office.

Mr. Gibson—I have pleasure in nominating Mr. John Shaw.

Mr. Jones—I would move that Mr. A. R. Davis be a candidate for the office.

Mr. Code—I have much pleasure in nominating Mr. J. H. Moore.

There being no further nominations, the President declared the nominations closed.

Mr. van Nostrand—I have pleasure in nominating Mr. Burd as one of the Auditors for the ensuing year.

Mr. Speight—I move that Mr. Burwash be one of the Auditors.

There being no further nominations, on the motion being seconded by Mr. Dickson, Messrs. Burd and Burwash were declared elected Auditors for the ensuing year.

The President—I appoint Mr. W. A. McLean and Mr. H. L. Esten as Scrutineers to count the ballots in connection with the votes cast for elections to the Council.

UNFINISHED BUSINESS.

Mr. van Nostrand moved, seconded by Mr. A. S. Code, that the sum of $5 be granted to each of the Auditors acting in that capacity for the past year's accounts. Carried.

Moved by Mr. Dickson, seconded by Mr. Davis, that this Association desires to express its thanks and appreciation of the honor conferred by the Engineers' Club, Toronto, in making our members honorary members of the club during the present meeting. Carried with applause.

Mr. van Nostrand—I beg to move, seconded by Mr. Davis, that we refer back to the previous order of business, election of officers. Carried.

Mr. Dickson—I move, seconded by Mr. Davis, that Capt. Gamble be re-elected Secretary-Treasurer. Carried with applause.

Capt. Gamble—I thank you again, gentlemen, for the confidence you have reposed in me. I feel that I do not perhaps carry out the position of Secretary as well as others might do, but I always have the interests of the Association at heart; I do my best, and I hope I shall be able to carry on more satisfactorily in the ensuing year, especially if we get proper quarters to do our work in.

On motion of Mr. Davis, seconded by Mr. Dickson, the President left the chair and Mr. Speight took the same.

Mr. Dickson—I move that this Association extend a cordial vote of thanks to Mr. Whitson, the late and present President, for the able manner in which he has presided over this meeting and the way in which he has discharged his duties.

Mr. C. Jones—I second that.

Mr. Speight—You have all heard the motion. I am sure you are all entirely in sympathy with it. Carried with applause.

Mr. Speight (to Mr. Whitson)—I have great pleasure in conveying to you the appreciation of this Association for the able manner in which you have presided over this meeting and for the way in which you have discharged your duties.

Mr. Whitson—I am sure, gentlemen, I cannot express in words my appreciation of the honor bestowed upon me. It will always be my desire and pleasure to carry out the wishes of this Association and do all I can see in my power to advance its interests. Applause.

Mr. Whitson—I move that a vote of thanks be tendered the President of the Engineers' Association for the interest he has taken in securing us the quarters we have enjoyed during this meeting.

Mr. van Nostrand—I have much pleasure in seconding that motion. Carried.

Mr. Speight—Captain Gamble, President of the Engineers' Club, I have great pleasure in conveying to you the appreciation of our Association for the hospitality of the Engineers' Club and for their kindness in giving us the use of their club rooms and further services in connection with it.

Captain Gamble—The Engineers' Club are only too proud to have the opportunity of helping any sister society, and especially as we feel it may encourage other land surveyors (there are already a great many of the land surveyors members of the club) to come in; we will only be too happy at all times to welcome them,

whether they come as honorary members or whether they come and join us as active members in the future.

Mr. van Nostrand—I would like to say in this connection, while it is called the Engineers' Club, it was originally started by engineers, architects and surveyors, and these are the three professional bodies who specially compose the club. The surveyors are considered eligible as members, but it was only for the purpose of a short title it was called the Engineers' Club. In the meantime the engineers have been very kind to the surveyors for any services the surveyors have been able to give in establishing this club.

On motion of Mr. Dickson, seconded by Mr. Davis, the meeting adjourned at 12.30 p.m.

PRESIDENT'S ADDRESS.

To the Members of the Association of Ontario Land Surveyors:

Gentlemen,—We all regret the sad circumstances that have given to me the honor of opening this meeting. It, however, affords me great pleasure to extend to you a hearty welcome to this, the 19th Annual Meeting of our Association. It is gratifying to see so many of our members present, and I hope that this meeting may prove, not only profitable, but pleasant, and tend more and more to foster a feeling of goodfellowship among our members, as it has in the past.

To-day we meet a united and prosperous Association, although we mourn the loss from our ranks of several old and familiar faces, some who have done much to make this Association what it now is. Mr. Bolton, who had the honor of presiding here last meeting, has joined the great majority. Our President, Mr. Selby, as you are aware, lost his life in the far north in the Athabasca River, while in active service. We feel that we have each lost a personal friend in the death of these gentlemen, and this Association, as well as the Dominion Land Surveyors, two faithful workers.

In the death of Mr. Walter Beatty we lose one of our oldest and most respected members—a man who entered the profession over half a century ago, and during that time has followed many of the forgotten Indian trails into the far north and west, and has seen many flourishing towns and villages spring up on the sites of his old camp grounds. He was one of the links that bound the surveyors of the past with those of the present generation.

I have also to mention the removal from among us by death of John Edward Schwitzer, George Charles Rainboth, Joseph Doupe, J. J. McKenna, and Albert George Stacey.

We are glad to know that our veteran examiner, Mr. P. S. Gibson, was able to attend to his duties on the Examination Board last week. The last year has been one of the most prosperous in the history of our Association, so much so that the Secretary has had great difficulty in getting members to contribute papers. This is to be regretted. We should each individually be interested in the welfare of our Association and in some way contribute to its success. The rapid development of the Northwest Territory has taken many of the surveyors outside the Province on Dominion work. That, with the construction of the Transcontinental Railway and the extension by our own Provincial Government of the T. & N. O. Railway, has opened up almost a new Province north

of the Great Lakes. That, with the development of the mining resources, has given employment to a large number of surveyors.

The Provincial Government last year made extensive surveys of base and meridian lines, through parts of the unexplored territory, and the Secretary-Treasurer assures me that the financial condition of the Association is in better shape than ever before. I think that it is time that we took steps to procure a suitable repository and office for the Secretary, as the offices used as a repository in the Crown Lands Department are now being occupied by the Department and will not likely be available in the future. Authority should be given at this meeting to the Secretary to engage suitable quarters.

The Municipal Drainage Act, the Ditches and Watercourses Act, the Municipal Aid Act and the Tile Drainage Act have been revised and are now printed in pamphlet form, as also have the Registry and Land Titles Acts. The Surveyors' Act has also been revised and has been printed with the amendments as suggested by this Association two years ago, and is only now awaiting the sanction of the Legislature and it is hoped before many months that this Act will be printed in pamphlet form and ready for distribution.

There is one important question, which I hope will be thoroughly discussed at this meeting, that is the advisability of having permanent iron monuments planted at one angle, at least, of every mining claim surveyed in the unsurveyed districts. This matter should be brought before the attention of the Minister of Lands, Forests and Mines, as you are all aware that the clearing off of the timber or the destruction by forest fires of the original wooden posts or blazed lines is going to make it very difficult in the future to re-establish the boundaries of mining claims, owing to the irregular way in which they are now laid out.

Perhaps it will not be out of place if I were to briefly review a few of the good results which have been partly brought about by the work of this Association. Some years ago it was strongly recommended by our members that it would be to the public interest to undertake a thorough exploration of our northern districts, with a view to finding out whether they were of any commercial value or not. At that time it was considered by a great many that the money being spent in surveys in that region was a waste of public funds.

Had the Canadian Pacific Railway not been constructed, Northern Ontario and the Great Northwest to-day would not be much in advance of what it was a quarter of a century ago. Until the advent of this railway there was never a dream of anything so extravagant as even a stage line along the north shore of our

Great Lakes. There was no business to support a railway until a railway came and created business, and while untold riches lay within easy reach of all, there was lacking the one thing, the first essential for civilization, transportation. Production without transportation is often possible, but seldom profitable, consequently our nickel and copper mines of Sudbury, our silver mines of Cobalt, and our iron mines, lay untouched where a generous Providence had placed them. We must give a great deal of credit to the men, who in the early seventies had faith enough in this country to undertake the construction of that railway through an unknown region.

The builders of that road uncovered the greatest nickel and copper deposits in the world, which after little more than 20 years have produced more than 200,000 tons of metal, valued at nearly 120 millions of dollars, when refined. Last year Sudbury's production amounted to $5,400,000 in the matte, or $12,000,000 in refined metal. The builders of the Temiskaming & Northern Ontario Railway uncovered Cobalt, with all its untold wealth of silver and other minerals, with almost a single stroke of the pick, and now, after five years' development, this small area has produced over fifty millions of money. In 1910 the production amounted to fifteen and one-half million dollars. Cobalt produced last year in silver half as much in value as did the Caribou diggings in gold in twenty-five years, and has increased the provincial revenue by over three and three-quarter million dollars.

We cannot but admire the courage and foresight of our Provincial Legislatures of to-day in extending our Government line of railway to tap the Transcontinental, but this country has been well repaid for all this expenditure by the opening up of large areas of fine agricultural land and the discovery of a new mining camp at Porcupine, which bids fair to rival Cobalt. These undertakings would never have been begun had not the surveyors and engineers and geologists first ascertained by exploration that the country warranted such an expenditure. The reliable reports of the men of our Association, who first explored the great northern clay belt, went a long way in deciding the Government and capitalists to undertake the building of the Transcontinental line, the construction of which, along with our own Government railway to Cochrane, has rolled back the map of New Ontario more than 150 miles. Mr. Alexander Niven, whom we look upon as "Ontario's Pathfinder," in a paper read before this Association in 1899, in describing the country through which the Transcontinental Railway was afterwards to pass, said in these brief words:

"A little beyond the 100th mile we entered upon good land, the level country, that extends to James' Bay, and for the remain-

ing 200 miles of the line the country is almost as smooth as the lawn in the front of the Parliament Buildings. It could be described as an inclined plane falling to the north, but so gradually descending as to be almost imperceptible to the eye. For over 120 miles the line runs through a splendid tract of farming land, clay soil. There are not many places in Old Ontario where a line can be run for the same distance through such an even tract of country."

Had that paper, with its reliable information, been the only one published by this Association since its organization, the work of the Association would not have been in vain, and while there are other members, whom space will not permit me to mention, whose outline and exploratory work in our northern wilds has gone a long way in directing public attention to the great resources of that section of this Province, I merely mention these facts to show that this Association can take at least some credit for the development which has been brought about north of the Great Lakes within the last twenty years, and to remind you that we too often forget the measure of praise that is due to some of our early explorers and older surveyors. I doubt very much if our veteran explorer, Mr. Niven, ever dreamed when running the district boundary from Sudbury to James' Bay, a distance of over 300 miles, through an almost unbroken region in 1896 and 1898, that in a short space of 12 years he would be able to cover almost two-thirds of the distance in a Pullman car in less than 18 hours, and in less than a year from to-day will be able to traverse by rail the entire clay belt from the Quebec boundary to Lake Nepigon. I think not. Between the survey of the first meridian line into the clay belt and the construction of the railway is only 12 short years in time, but a long way in achievement.

We have still a very large unexplored area, which I think will well repay this Province to investigate in the near future, and may lead to results equally important to those of the last few years.

I feel that I am trespassing on your time, but I wish to draw the attention of our younger members to this fact, that while our membership is rapidly increasing, our field of operations is daily widening. It has already demonstrated beyond doubt the richness and resourcefulness of our northern country, where the surveyors will find for many years to come profitable employment in the mining districts, in drainage work and local surveys in the agricultural sections The successful application of electrical power has produced a new era in the world, and the surveyor who equips himself for this class of work will always find employment in our new district, which everywhere abound in water powers.

REPORTS.

SECRETARY-TREASURER'S REPORT.

Mr. Chairman,—I have the honor to lay before you the report of the official business of the Association transacted by me between the 5th March, 1910, and the 25th February, 1911. The "Papers" that had been read and the minutes of our Annual Meeting were revised and prepared for publication as early as possible.

We sent copies of our Reports to the following societies:

School of Practical Science, Engineering Society....	200 copies
Michigan Engineering Society.....	200 copies
Illinois Society, Engineers and Surveyors.....	180 copies
Indiana Engineers' Society.....	150 copies
Iowa Civil Engineers' and Surveyors' Society.....	120 copies

And copies of the Reports we received from them were as far as possible distributed among the members who were not in arrears with the Association.

During the year eighteen new members were received into the Association, one member on the withdrawn list returned to the active list, and we have to regret the loss by death of the following: Messrs. H. W. Selby, J. J. McKenna, Lewis Bolton, Albert Stacey, G. C. Rainboth, J. E. Schwitzer and Walter Beatty.

Our Department of Repository and Biography seems to continue in abeyance, and we are urgently in need of an office and library, as our present quarters are quite untenantable.

Our thanks are due to the various departments through whom we have regularly received the Annual Reports of the United States Coast and Geodetic Survey, the Geological Survey of Canada, the Dominion Archives, and the Ontario Reports of the Bureau of Mines, and the Bureaus of Industry and Forestry.

The financial statement accompanying this report shows the favorable condition of our affairs.

In conclusion, I wish to return my hearty thanks to the officers and other members of this Association for their forbearance towards me and for the help they have given me in the fulfillment of my duties.

Respectfully submitted,

KILLALY GAMBLE,

Secretary-Treasurer.

STATEMENT OF BALANCES, RECEIPTS AND EXPENDITURES BETWEEN 5TH MARCH, 1910, AND THE 25TH FEBRUARY, 1911.

Dr.

Balance in Savings Account 5th March, 1910	$2.099 90
Balance in Current Account 5th March, 1910	1,851 68
Receipts in Board of Examiners' Account, including Government grant of $200 and regular fees	1,205 00
Annual fees, including Associate fees	480 00
Amount collected from advertisements	40 50
Accrued interest on Savings Account	63 45
	$5,740 53

Cr.

Amount for publishing Proceedings, 1910-1911	$ 387 80
Amount reprinting Survey Act, By-laws and 200 Azimuth Tables	173 50
Amount granted to Secretary-Treasurer	325 00
Amount paid for Postage and Express	85 63
Amount paid for Printing and Stationery	71 70
Stenographer for reporting the Annual Meeting	55 00
Armour & Mickle, Solicitors	13 21
Amount granted to Auditors	10 00
Marking Standard Tapes	14 00
Freight, Cartage, Brokerage and Sundries	14 07
L. D. Barber, refund of fee for Articles	10 00
Premium on Secretary's Bond	7 50
Herbert Beatty, Council meeting 18th April, 1910	24 40
	$1,191 81
Amount of Disbursements in Board of Examiners' Acct.	581 67
Balance in Savings Account	2.163 35
Balance in Current Account	1,803 70
	$5,740 53

KILLALY GAMBLE,
Secretary-Treasurer.

AUDITORS' REPORT.

We hereby certify that we have examined the Secretary-Treasurer's vouchers, receipts, financial statement and bank accounts, and find them correct.

N. A. BURWASH,
J. H. BURD,
Auditors.

REPORT OF COUNCIL OF MANAGEMENT.

Toronto, February 28th, 1911.

The Council begs to report to the Association of the Ontario Land Surveyors that it has held two meetings since the last meeting of the Association; one on the 19th of April, 1910, and the other on the 28th February, 1911. At the meeting on the 19th April Mr. George B. Kirkpatrick was appointed Chairman for the ensuing year. Mr. J. F. Whitson resigned from the Council, having been elected Vice-President of the Association. Mr. H. McC. Watson was appointed to fill the vacancy in the Council caused by the resignation of Mr. J. F. Whitson.

The names of the members of the Standing and Special Committees were approved, the Chairman of each being as follows:

Land Surveying—A. Niven.
Drainage—George Ross.
Engineering—J. Hutcheon.
Topographical Survey—T. Fawcett.
Entertainment—J. F. Whitson.
Publication—Killaly Gamble.

The Chairmen of the Special Committees were as follows:

Legislation—G. B. Kirkpatrick.
Repository and Biography—H. L. Esten.
Exploration—H. W. Selby.
Polar Research—Willis Chipman.

By-law No. 51 was passed, providing for the exemption of Henry Carre from the operation of the Act to incorporate the Association of Ontario Land Surveyors.

As regards unauthorized surveyors, the Chairman was empowered to deal with complaints of this nature, and if necessary to employ a solicitor.

Changes made in the personnel of the Board of Examiners are as follows: Messrs. P. L. Gibson and Alexander Niven were re-elected members of the Board of Examiners for the term ending April, 1913.

The Council has to regret the loss of eight members of the Association by death since the last meeting, namely:

H. W. Selby, President of the Association, by drowning in the Athabasca River.

Edward J. Rainboth, Ottawa.
Roderick McLennan, Toronto.
John E. Schwitzer, Montreal.
John J. McKenna, Dublin.
Lewis Bolton, Listowel.
Walter Beatty, Delta.
Albert G. Stacey.

Respectfully submitted,

GEO. B. KIRKPATRICK,
Chairman of Council.

BOARD OF EXAMINERS' REPORT.

The Board of Examiners met in the Board Room, Department of Lands, Forests and Mines, on Monday, the 13th of February, 1911, and adjourned to the University Buildings for their sittings.

The following candidates passed their preliminary examination:

Oliver Smith, Lindsay.
Albert Joseph Mark, Hamilton.
Erling Peter Gibson, Willowdale.
Carman Rice Kenny, Sudbury.
Joseph Patrick Power, Sudbury.
Charles Vincent Gallagher, Warkworth.
Robert Lorne Campbell, Toronto.
Frank Herbert Muckleson, Toronto.
Roy Stanley Kirkup, Fort William.

The following candidates passed the required final examination:

John Edwin Jackson, graduate School Practical Science, Brantford.
Alec. Roger, Ottawa.

Charles Hartley Attwood, Hamilton.
John Alex. Brown, B.A. Sc., Sarnia.
John Thomas Ransom, B.A. Sc., D.L.S., Toronto.
Calvin Bruce Allison, graduate School Applied Science, D.L.S., South Woodslee.
William Emerson Taylor, B.A. Sc., D.L.S., Toronto.
William Graham McGeorge, graduate School Applied Science, D.L.S., Chatham.
Nicolas James Slater, B.A. Sc., Ottawa.
Albert McMeekin, Kenora.

Their certificates to bear date 22nd February, 1911.

The following gentlemen passed their final examination successfully, but their term of apprenticeship was not quite out:

Albert Ernest Jupp, B.A. Sc., Toronto, apprenticeship ends 2nd May, 1911.

Russel Reeves Grant, graduate School Applied Science, Toronto, apprenticeship ends 23rd March, 1911.

Ralph McKenzie Anderson, B.A. Sc., Toronto, apprenticeship ends 2nd May, 1911.

Harry William Tate, B.A. Sc., Toronto, apprenticeship ends 25th April, 1911.

The following bonds have been approved and filed with the Provincial Treasurer in accordance with the Revised Statutes of Ontario, 1897, chapter 180, section 36, subsection 2:

Alec. Roger.
Mason Herman Baker.
Lionel D. N. Stewart.
Alexander S. Campbell.
Roger M. Lee.
Ernest A. Snow.
W. A. McM. Cook.
John van Nostrand.
W. J. Johnston.
W. H. Browne.
Thomas H. Byrne.
H. O. Dempster.
F. J. Anderson.
Tracy D. LeMay.
Ira J. Steele.
John Thomas Ransom.

The following articles were filed by the undernamed pupils during the year:

Name of Pupil	Name of Surveyor	Residence	Date of Articles	Terms
Keys, H. J. E.	J. L. Lang	Sault Ste. Marie	Jan. 25, 1910	3 years
Benner, F. J.	R. S. Code	Alvinston	Feb. 28, 1910	3 years
McKnight, A. W.	Mahlon Davis	Berlin	March 3, 1910	1 year
Jardine, W. S.	T. J. Patten	Little Current	March 11, 1910	3 years
Helferth, J. B.	Speight & van Nostrand	Toronto	March 14, 1910	3 years
Keys, W. R.	H. J. McCauslan	North Bay	April 1, 1910	1 year
Dynes, R. F.	C. H. Fullerton	New Liskeard	May 27, 1910	1 year
Stone, C. A.	E. O. Tuce	Galt	Aug. 10, 1910	1 year
Baird, W. J.	S. B. Code	Smith's Falls	Oct. 3, 1910	1 year
Baird, A.	J. A. Baird	Leamington	Jan. 16, 1911	1 year
Lloyd, N.	H. L. Esten	Toronto	Feb. 1, 1911	1 year
Hogarth, G.	A. B. Halford	Toronto	Feb. 5, 1911	3 years
Jackson, A. M.	W. A. Fairchild	Brantford	Feb. 6, 1911	1 year
Brown, W. L.	E. J. Boswell	Montreal	Feb. 10, 1911	1 year
Gallagher, A	Ernest Neelands	New Liskeard	Feb. 18, 1911	3 years
Gibson, E. P.	W. S. Gibson	Davisville	Feb. 25, 1911	3 years
Kenny, C. J.	DeMorest, Stull & Scn	Sudbury	Feb. 25, 1911	3 years
Campbell, R. L.	G. S. Abury	Toronto	Feb. 27, 1911	3 years

Respectfully submitted.

GEO. B. KIRKPATRICK,
Chairman of Board.

REPORT ON TOPOGRAPHIC SURVEY.

The Topographic Surveys of Canada during the past year have been confined principally to the International boundary survey, the precise levelling surveys and exploratory work undertaken for various purposes in different parts of our Dominion. In connection with the demarcation of the International boundary between Canada and the United States, a correct topographic survey of a belt from one to three miles wide has been made, the data having been secured by means of triangulation, plane table work, traverses with transit and tape, levelling and stadia measurements, camera, micrometric, and any other means available for gathering the information necessary to compile an accurate topographic map of the belt or belts included within the limits of the survey. There were during the past year parties at work on the 141st meridian which divides Alaska from the Yukon Territory, parties also along the coast range marking the boundary agreed upon between Alaska and British Columbia, parties between Alberta and Montana, Maine and Quebec, Maine and New Brunswick—all joint parties, representing Canada and the United States. The first mentioned parties were marking the boundary for the first time, and the others re-

tracing lines formerly established and replacing the old monuments by monuments of a more permanent character, with tablets set in concrete and so connected and referenced that if destroyed it would be an easy matter to re-determine the lost points by consulting the notes and maps which will be placed on record as the work advances.

Precise levelling surveys have been carried on in New Brunswick, Quebec, Ontario, Manitoba and the Yukon Territory. By this means the elevation of points or of tracts of country in relation to the sea level is determined, and by planting or establishing permanent bench marks data is provided which can be used in future as reference points, and all work undertaken for any purpose whatever can be referred to the same datum plane and thus correctly mapped in that respect, as the points determined by the precise levelling parties are established through backward and forward levelling with the greatest possible care, the computations being checked and re-checked in the office, so that every care is taken that the elevation of every bench mark as tabulated shall be correct. For bench marks copper bolts are used, which are either set in concrete or leaded into holes drilled into walls or into solid rock, and where the surveys have been carried through cities or towns bench marks have been set in the walls of public buildings, such as post offices and town halls, where they will be at all times accessible.

The precise levels are generally carried along the lines of railway, the railway companies having granted permission to the levelling parties to use hand cars on their tracks when moving camp, which is a great help in the way of transport, and the grades along the railway permit the work to be carried on with much greater speed than by any other route. Continuous levels have been carried from the ocean in Quebec to Windsor, along the southerly portion of Ontario, and in the other Provinces mentioned above the same methods and care is observed throughout all the operations. Topographic surveys have been made at several points, both in Ontario and Quebec, under the Department of Militia, and we may expect vastly improved maps from this source, as use is being made of the points determined by the Geodetic Survey as a means of control for their maps.

Other surveys which would rightly belong to this division are those carried on for the purpose of determining the volumes of streams for water powers and as a source of electric energy along proposed railways. Surveys were carried on during the past season along the streams convenient to the proposed route of the Hudson's Bay Railway, to ascertain as near as practicable the amount

of power available long that rod. Such information will enable the Government or others to whom the work may be delegated to determine whether electric power or that generated by steam will be the more economical in operating that railway. There is still much work to be done along these lines, and a work to which the Provinces should direct their attention. The waste of water during spring freshets still goes on, and with this the destruction of valuable property.

The most urgent work in this connection would be a topographic survey of the streams and immediate surrounding country to determine sites for storage basins or reservoirs where the water could be held back until needed during periods of low water, so that the flow should be uniform as nearly as possible the year round, and also to stop the destruction of property, which is becoming more of a menace year by year, by constructing dams and storing the water at such points as are found to be most suitable. The Geodetic Survey of Canada, which will be dealt with in another paper, and which is now carried on in connection with the Astronomical Branch of the Department of the Interior, has its triangulation stations selected throughout all the thickly settled portions of Quebec and Ontario, and all the points east of Peterboro have been occupied by the observers and the data now in the hands of the computing staff, who will find the exact geographical positions of all those stations and tabulate them for reference when required in correcting the maps of the several Provinces or tieing in local surveys, and any survey undertaken for public or private information which is connected with any one of those geodetic survey stations will have its location accurately determined, that it will always occupy the same position on all maps which shall be compiled in the future.

THOS. FAWCETT.

REPORT OF EXPLORATION COMMITTEE.

Your Committee on Exploration have to report that during the past year over 1,100 miles of township outline, base and meridian line have been run in different parts of the Province, and also traverse made of some large lakes, including Sturgeon, Oba, Wabatongeshene and Night Hawk, and surveys of some of the water powers in Northern Ontario, all under instructions from the Department of Lands, Forests and Mines. In addition to this, much exploratory work from a geological standpoint has been carried on by the Department of Mines. It may safely be said that at least

four-fifths of the surveys being carried on by the Province are of an exploratory nature, and our great northern heritage is becoming daily better known to ourselves and to the world.

New fields to explore for the prospector and tourist are being opened up by the pushing forward of the work of the C. N. Railway and the Transcontinental across the Province. There is no doubt that the development of our whole north country is directly attributable to the information gained by exploratory work. By this means the Department and the general public became first informed that north of, and beyond the rocky fringe along the north shore of Lake Superior and over the Height of Land, lay an immense area of agricultural land, which led to projection and construction of the Temiskaming & Northern Ontario Railroad, with consequent discovery and the development of the vast mineral resources of Cobalt, South Lorrain, Elk Lake, Gowganda and Porcupine, and gave to Ontario the first place among the countries of the world as a nickel producer and third place as a producer of silver, and it is safe to predict that it will in the near future take a prominent place among gold producers.

There is also no doubt that the exploratory meridian lines run from time to time in the past and tapping the great clay belt demonstrated to the engineers of the Transcontinental Railroad that the proper location for that road was away north, and the result is that we will soon have the finest roadbed of any Transcontinental railway, with minimum grades, crossing for a thousand miles a rich agricultural, mineral and timber area of the northern part of the Province.

Your committee are of the opinion:

(1) That one of the most beneficial exploratory surveys would be a traverse of the large rivers flowing both north and south from the Height of Land and of the head water lakes, acquiring information as to the exact location, water powers, volume and a general description of the country tributary thereto, with respect to altitude, soil, timber, mineral and means of conservation.

(2) That in township outline surveys a traverse should be made of the larger lakes and water courses within the area outlined.

(3) That in base and meridian line surveys some system of establishing approximate altitudes would be of very great advantage, and that the different water courses crossed in course of the survey be explored for some distance from the line.

You are all well aware of the great natural resources of this Province, and none of us doubt that the resources yet unexploited and still hidden will equal those already known. A rigid exploration of our northland is, we believe, one of the most important undertakings for the Province to-day. Explore, develop and conserve our natural resources, is a motto worthy of all good citizens.

Respectfully submitted,

L. V. Rorke, Toronto.

REPORT OF COMMITTEE ON ENGINEERING.

Gentlemen,—The past year has been one of unusual activity in the construction of engineering works in Canada, and probably never before in the history of the country has so much work been done in one year, while the prospect for the future appears to be equally promising.

The development and transmission of electricity has continued to hold a foremost place in the works of this Province.

The transmission lines of the Hydro-Electric Power Commission are now extended over a considerable portion of the western peninsula and power from Niagara Falls is being distributed to a number of municipalities, while towns beyond the reach of that source are being supplied from many smaller streams throughout the country.

Railway construction has surpassed all previous records, both in the amount completed and in the mileage still under construction. Two or three more years will connect the east with the west by two new transcontinental railways, both of which will be very important factors in the development of the wealth of the northern portion of this Province. While this new work has been going on existing railways have at the same time been improving their lines, a notable example of which is the grade reduction of the C. P. R. main line in British Columbia, whereby the maximum grade of 4.2 per cent. in Kicking Horse Pass is reduced by means of spiral tunnels to a 2 per cent. grade.

The use of cement concrete in building construction still continues to advance. In short span bridge work, plain or reinforced concrete is now the usual material of construction, and the span limit for such bridges is being extended year by year.

Concrete is being put to new uses each year, new methods of construction are being devised and great advance is being made in the quality and appearance of the finished product, and the whole seems to indicate that great advances will still be made in concrete construction.

The improvement of the roads in Old Ontario has received much attention and financial assistance within the last few years. The increased automobile traffic of late has caused the road question to assume greater importance and we look forward to a new era in highway construction, which will result in the adoption of comprehensive plans for the improvement of our leading thoroughfares and in the construction of such roads of a more durable character, coupled with an intelligent system of maintenance.

The greatest single engineering work now in progress is the Quebec bridge, and it is surely gratifying to the profession to know that one of the great bridges of the world is being built in Canada by a Canadian company.

JAMES HUTCHEON,
Chairman.

REPORT OF COMMITTEE ON LEGISLATION.

The committee begs to report as follows:

Nothing special has engaged the attention of your committee this year, but it is interesting to know that this year the Revised Statutes are being revised and Bill No. 79, an Act respecting Land Surveyors, and Bill No. 80, an Act respecting the Survey of Lands, are before the House for the third reading now.

Both Acts were very carefully gone over by the commission empowered to revise statutes, and a great deal of redundant matter was left out and the clauses made simpler. The additions to each Act which were asked for by the Association last year have been embodied in the Acts. Those sections marked "New" in the two Acts are the ones that have been either altered or introduced wholly new. For instance, in the Act respecting Land Surveyors, the 5th section has been newly written, that is, permitting the Association to purchase or sell real estate. Section 25, Qualifications for Admission to Practise, has had added to the subjects the method of calculating the h.p. of rivers and streams, the method

of scaling logs and measuring timber. Section 37, sub-sections 4 and 5, are new. These provide that a High Court or Judge may extend the time for appealing for a further period not exceeding 14 days. That the appeal shall be set down to be heard at the Court within one month after the time of the extended time for appealing has expired.

In the Act respecting the Survey of Lands the following are the more important changes: Section 6, sub-section 2, provides that any person interfering or obstructing a surveyor in the exercise of his duties shall incur a penalty not exceeding $100. Section 29, sub-section 4, is entirely new, and the other sub-sections have been differently worded, so as to make it clear what is intended. Section 31, sub-section 3, is new. This is to apply in sections or blocks of 2,400 acres, 1,000 acres or 640 acres or thereabouts. Sections 42 and 43 are new. Section 42 explains how a blind concession line is to be established. Section 43 applies to broken front concessions.

These are the principal changes, but the wording of a good many sections was changed by the committee, so as to make it more intelligible.

All of which is respectfully submitted.

GEO. B. KIRKPATRICK,
Chairman.

REPORT OF DRAINAGE COMMITTEE.

Mr. President,—Your Committee on Drainage for the year 1910 beg leave to report as follows:

During the past year drainage engineers in the Province of Ontario have had about their usual amount of work in laying out and reporting on drains under the Municipal Drainage Act, and in making awards under the Ditches and Watercourses Act, and occasionally some of us have still to receive lessons from the Drainage Referee and County Judges on the interpretation of these Acts. Although the Drainage Acts are now becoming better understood, there will no doubt always be a considerable amount of litigation over matters relating to drainage work, no matter what changes may be made in the wording of the Acts.

During the year 1910 the Drainage Acts were consolidated and issued in pamphlet form, and this was a great convenience for all parties concerned.

In some recent cases where actions for damages were taken in the High Court by owners of lands against municipalities, for injury to such lands by waters brought down faster than by natural conditions, owing to the construction of culverts or drains by such municipalities by statute labor, or out of the general funds, said actions were transferred for trial before the Drainage Referee, and in all cases where lands are injured in any way by waters being brought down on them by such culverts or drains the decision is against the municipalities, and a sufficient outlet is ordered to be made under Section 78 of the Drainage Act, 1910. From this it will be readily seen that Section 78, which is the same as Section 76 of the Act of 1897, is a very important one, providing as it does for the construction of large drainage outlets without a petition.

In some cases where actions for damages were brought for injury to comparatively small areas of land, outlets costing large sums of money were required to be constructed. In this connection the following extracts from a letter written by Matthew Wilson, K.C., may be of interest:

"It will be remembered that the people in Sherbrooke (the upper township) have a right to drain into that Little Marsh course all the water that would naturally go there if no ditching were done in Sherbrooke and if no highways were thrown up so as to prevent the water crossing into that course at the back of Mrs. Young's place and at different points near there.

"We quite understand that both at the back of the Second Concession, as well as the front of it, the depressions and ridges run in the direction we have indicated, but at the same time the depressions to the west are lower than the depressions to the east, so that if the ridges are cut through on either of the concession roads or on the town line, the water will find a ready fall to the west. That, however, does not do away with our contention that when you take these waters to the west through the ridges they become foreign waters in the Furry Drain, so that the Township of Sherbrooke (the upper township) has to pay for their entire course; while if they are continued northerly towards the Little Marsh, then the Township of Sherbrooke is draining in the natural course of the waters, and does not have to pay for an outlet for such of the waters as would go there in a state of nature. In other words, while you drain in the natural course by the Little Marsh, section 3, sub-section 5, applies and the assessment for outlet is only to the extent that the water is caused to flow by artificial means, that is, by digging. In this way Sherbrooke people would have to pay for the outlet only for the excess of water caused to flow by the artifi-

cial digging over what would naturally flow without the digging. The Township of Moulton (the lower township) would have to bear at their own expense the making of an outlet for all that would come from Sherbrooke (the upper township) in a natural state, with all logs and debris cleaned out of these natural runs."

It has been suggested by some of our members that it would be advisable to have appeals under the Ditches and Watercourses Act heard by the Drainage Referee, instead of being tried before County Judges, and the statement is made that some of the County Judges have very poor ideas regarding questions of drainage, but although we are aware that appeals under the Ditches and Watercourses Act should be heard without delay, and that they should be disposed of with the least possible expense, we are of the opinion that in any case where the cost of such drain exceeds the sum of five hundred dollars, an appeal from the County Judge to the Drainage Referee should be allowed.

The suggestion has also been made that the time for filing an award under the Ditches and Watercourses Act should be extended from thirty to about sixty days, and we think that such a change is desirable. With regard to the meaning of the term "within thirty days," the following paragraph from Proctor's Drainage Cases may be quoted:

Within Thirty Days.

In Bigford v. Baile (1904), 40 C.L.J. 785, Reynolds, J.J.C.C., held that this is a directory provision and not imperative, and declined to set aside an engineer's award on the ground that it has not been made until after the expiration of thirty days from the date of the first meeting. This decision is in agreement with cases determined upon a construction of analagous provisions of this Act and of the Municipal Drainage Act. Maisonneuve v. Tp. of Rexborough (1899), 30 O.R. 127 at p. 131; Thackery v. Tp. of Raleigh (1898), 25 A.R. 226 at pp. 238, 241. See also Re Tp. of Muskoka and Village of Gravenhurst (1884), 6 O.R. 352 at p. 355; Re Smith and Tp. of Plympton (1886), 12 O.R. 20 at pp. 34, 35.

Some of our members also consider that it would be an improvement to make some changes in section 6 of the Ditches and Watercourses Act, claiming that the latter half of this section, beginning with the words "but the lands through or into which the drain does not pass" is very obscure. With regard to this section we beg to quote the following paragraph from Proctor's Drainage Cases:

Lands Liable for Construction.—The proper construction of this section would appear to be that all lands through or into which the ditch passes or which lie within the specified distance of it, may be assessed for their fair proportions of the work and material necessary to complete it, and if so charged will be conclusively presumed to be benefited to the extent of the shares assigned them, except in so far as the engineer's award may be varied on appeal, as provided by section 22; but that lands through or into which the ditch does not pass, and which adjoin a road allowance traversed by the ditch, shall not be liable except when directly benefited, the question of benefit to be determined upon the facts in each such case.

Another very important matter that is well worthy of the most serious consideration is that dealt with by George Smith, Esq., O.L.S., in his paper read before this Association at our last meeting, in which he advocated a radical change in the Drainage laws and the appointment of a County Board of Drainage Commissioners.

There are some questions relating to the Municipal Drainage Act which should be carefully considered by the Surveyors' Association and some action taken if possible to have the Act so amended as to correct such provisions which are manifestly unfavorable to the profession and which cause a considerable amount of doubt as to the intention of the Legislature. The first relates to the audit of the engineer's account.

Section 5a of the Act directs that if required by the Municipal Council the engineer shall send in his account for his services in connection with the projected drainage scheme under oath, giving specific and detailed information, and if the Municipal Council or any body assessed makes a written request for an audit of this account, the County Judge shall audit the same and may disallow any charge which he may deem unreasonable, and shall certify the amount to which in his opinion the engineer is entitled, and the amount disallowed shall not be recoverable by the engineers.

This section may have been framed with the idea that such a course would provide a ready, simple and prompt method of adjusting the account between the engineer and the township, but such intention is not expressed in such a way as to give it any effect, the result being that although it is within the power of the County Judge to release the township from more or less of its obligation to the engineer, it does not give the engineer any right to recover from the township even the amount which the County Judge allows him. It is still open to the township to object to the account on other grounds than relate to the question of reasonable

charges, and if the township refuse to pay the amount awarded by the County Judge, a suit at law is still necessary to recover it. In other words, no advantage whatever is obtained by the engineer by such an audit and he is forced to considerable expense sometimes to defend his account without any resulting benefit, except to reduce as far as possible the amount which may be disallowed. Any expense that he is put to in so defending his account he cannot recover from the township, because no power is given to the County Judge to award costs even though the claim of the engineer may be practically substantiated.

There is no tariff or any means by which the County Judge can be guided in fixing the fees of the engineer unless there is a clear contract relating to fees between the engineer and the township (and even if there is, it is quite possible that any party who is assessed may call it into question) and in the absence of recognized tariff or schedule of fees which the County Judge can rely on, he is left entirely to decide the question on general principles and upon the evidence of expert engineers as to the reasonableness of the charges contained in the account. There might well be a provision in the Act adopting a tariff or providing some definite way of fixing the fees to which the engineer is entitled.

Another grave oversight in said Sec. 5a of the Act is the want of any provision for an appeal from the decision of the County Judge. In the case of Moore v. March, 14 O.W.R., p. 1194, and 20 O.L.R. 67, it was held by the Divisional Court that the County Judge had power to fix any amount he (mistakenly or otherwise) considered the engineer entitled to and even though the Divisional Court, as in the case just referred to, questioned the correctness of the Judge's decision they could not interfere. This necessarily will result in a different standard of costs for each county, and the only way to overcome such a difficulty is to provide for an appeal to at least one higher Court or to the Drainage Referee.

Another amendment that is advisable relates to the jurisdiction of the Referee in questions arising between the engineer and municipality. The section of the Act which defines the authorities and powers of the Referee, while apparently very wide, have been interpreted by the Courts in the cases of Bank of Ottawa v. Roxborough, 18 O.L.R. 511, and Moor v. March, 14 O.W.R., p. 1066, not to include all cases relating to disputes arising from drainage works under the Act, and particularly the disputes between an engineer and the municipality. A recent amendment has made it possible, in actions which are brought in the High Court and which should properly be disposed of by the Referee, for an order to be made transferring the action to his Court, but there is no provision

enabling the Referee to send any case brought before him improperly to another Court, and in the latter of the two cases above referred to the engineer having prosecuted his action up to trial in the Referee's Court, was prohibited from proceeding further and his only recourse lay in instituting a fresh action in the High Court. It would seem advisable therefore, either to widen the present jurisdiction of the Referee or to give him power to transfer cases from his Court to the higher Court if improperly brought before him.

All of which is respectfully submitted.

GEO. ROSS,

Chairman.

REPORT OF COMMITTEE ON POLAR RESEARCH.

Mr President,—Your Committee has but little to report this year.

At the Annual Banquet of the National Geographic Society of Washington on December 15th, 1909, Commander Robert E. Peary was presented with a special gold medal for the discovery of the North Pole on April 6th, 1909, and he was afterwards honored by the Royal Geographical Society of London, the Geographical Society of Berlin, and by several similar organizations in Europe. All doubt as to the authenticity of his claim have been set at rest, and in recognition of his distinguished services the American Government retired him from active service from the Navy with the rank of Rear Admiral.

Peary's rival for Arctic honors occasionally appears in the limelight, but his statements and claims only receive the ridicule they deserve.

Our own Arctic explorer, Captain J. E. Bernier, left Quebec on his third cruise on July 4th, 1910, and will probably return in September of this year. It is sincerely to be hoped that he may be successful in this voyage as in the two preceding.

From the Arctic, interest has now shifted to the Antarctic. Captain Roald Amundsen, the daring Norwegian, in Nansen's "Fram," and Captain Robert F. Scott (R.N.), in the "Terra

Nova," are struggling to reach the South Pole, their base of operations being Ross Sea, from which point Sir Ernest Shackleton attained Lat. 88° 23′ in 1909, distant only 97 miles from the Pole. Captain Scott left England in June, 1910, with a party of sixty men, including a large number of scientists.

A Japanese expedition led by Lieutenant Shirase, and a fourth under Captain Douglas Mawson, of Australia, also started for the same goal, but it is reported that owing to incomplete equipments the former decided to return.

A German Antarctic expedition under Lieutenant Filchner is proceeding to Weddell Sea to engage in scientific work, including geography, geology, oceanography, biology, meteorology and terrestrial magnetism.

Reference should also be made to the exploratory work done by Dr. Chariot in the "Pomquri Pas," also in the Antarctic regions.

Next year we would suggest that Captain Bernier be invited to give an address before the Association at the Annual Meeting.

Respectfully submitted,

WILLIS CHIPMAN.

REPORT OF COMMITTEE ON PUBLICATION.

After preparing the papers for publication and reviewing the minutes of the meeting as reported by our stenographer, and also having got ready the necessary diagrams for illustrating papers and reports, your Committee placed the publication of the Annual Report in the hands of the Business Printing Co., who carried it out very satisfactorily. 1350 copies were printed and distributed amongst the Societies who exchange reports with us, amongst the various scientific bodies and libraries we correspond with, and amongst our members. We have taken steps to increase our advertising.

Respectfully submitted,

KILLALY GAMBLE,
Chairman.

REPORT OF COMMITTEE ON ENTERTAINMENT.

Mr. President,—Your Committee on Entertainment beg leave to report as follows:—

As in the past the Committee effected the usual satisfactory arrangements with Mr. E. G. E. McConkey, who set apart the Rose and Nile Rooms for the occasion, and with nearly a quarter of a century of experience with our Association his arrangements were all that could be desired.

Among the invited guests present were Drs. Ellis and Galbraith, of Toronto University; Messrs. F. Arnoldi and F. Denton, representing the legal profession; Dr. J. S. Bach, whose skill in healing has been felt by more than one of our members; Mr. Geo. Le Mesurier, the distinguished financier; Mr. E. A. James, who is well known as the representative of the technical press; Mr. Stupart, who as "Old Probs" brings joy and sorrow to so many hearts; Mr. H. Irwin, a member of our sister organization in Quebec; Major C. H. Mitchell, prominent in the Civic Guild; Mr. E. C. Easy, C.E., a journalist of renown; Major H. Cowan, Messrs. B. G. Leigh, E. J. Jarvis, S. A. Griffin and H. B. Hellfirth.

Speeches, songs and stories from members and guests combined to make a pleasant evening. Your Committee noted with pleasure the active presence of such veterans as Messrs. James Dickson, E. Stewart, G. B. Kirkpatrick and Willis Chipman, but regretted the absence of Messrs. P. S. Gibson, A. Niven and a number of others whose faces for years have been familiar at our annual gatherings.

The thanks of the Committee are again due to the Secretary, whose generosity always relieves any anxiety as to the balance sheet.

Respectfully submitted,

J. F. WHITSON,
Chairman.

PAPERS.

(This Association is not responsible as a body for the opinions expressed in its Papers by Authors.)

A STADIA IN GEORGIAN BAY, DISTRICT OF PARRY SOUND.

BY A. G. ARDAGH.

Instructions for this survey were dated March 19th, 1910, and the survey was temporarily commenced a few days later. It was the intention of the Surveys Branch to have base lines for triangulation measured on the ice in preparation for the summer survey, and this could have been accomplished if the exceptionally warm weather of March in last year had not rendered the ice unsafe. I had hoped to use the ice to run a closed transverse completely around the district assigned to me, and at the same time leave bases for triangulation. An attempt to do this was made, but accomplishment was defeated by the state of the ice.

The survey was definitely commenced on April 18th. The backbone of the survey was a run of triangulation along the main open channels closing on itself, now and then, where the channels made this possible. The bases were measured with a 5-chain tape, wherever the ground was suitable. Such places were not easily to be had except at the outer reefs, and they varied from 5 chains to 20 chains in length. Starting from a measured base, the length of the next base was calculated trigonometrically, and compared with the actual measurement of the new base, which gave a check on the work in between. All angles were read singly and then doubled, as a check both upon sighting and reading, and all three angles of the triangle were read and totalled to 180 degrees. The instruments used were a D.L.S. Watt Transit, 6″ diameter, a Bausch & Lomb 4″ (a very fine instrument), with a Foster for spare. The instruments only read to minutes, half minutes being estimated; ad-

justment was frequently necessary to the angles. The bearings were checked by astronomic observation every now and then, with an error of a minute or two. For plotting, the latitudes and departures of the main courses were calculated. In two instances in cycles of triangulation of 15 miles each the error in the lats. and deps., as calculated, was over 1/10th of one per cent Although in the arrangement of pickets, selection of angles, etc., no great precision was aimed at, but only quick, practical results, yet I do not see the necessity for an error of this amount, and believe it was not wholly due to merely cumulative error. All township posts found on the mainland were tied in by triangulation.

The man doing the triangulation had a small board on which he plotted the triangles to scale on sheets. The angles were adjusted, if necessary, and the bearings and sides calculated following round each triangle and checking back on the first side. The triangulations points were indicated by the Greek letter and the turning points by the letter "T." Where more than one transit is engaged on the stadia work, each transit man should have his subscript to prevent confusion where the same numbers are used by each man, and the numbers should be marked on the pickets.

The stadia transitman takes the copy of the triangulation sheets with him that affect the part he is working in, and where passing a triangulation point, sets up at it and checks and corrects his bearings thereby. I think the stadia wires are best adjusted at 10 chains, so that exactly ten links are read on the rod. There will be a slight error over and under this distance, but of no practical account in intermediate readings.

Apart from the triangulation, the work consisted of a multitude of short shots, and for this the stadia wires appeared to be most apt and quickest, although I had a micrometer with me. The shots might average 8 or 10 chains, and rarely went up to 20 chains, even on turns. The transitman reads the rod and enters the distance first, reading his vernier while the rodman moves on, and no second instrument has to be consulted.

Stadia parties consists of three—transitman, rodman and steersman—the two latter together in a canoe. At first I furnished the transitman with a skiff, but latterly found that no time was lost by having the canoe men come back for him, as they had plenty of time to do it while he checked his bearings, marked his picket, made his sketches and got ready to move.

The Watf instrument read four ways to 90 degrees and one way from zero to 360 degrees, so that readings could be taken either

in quadrants or on azimuth; the latter is less productive of error, as occasionally the wrong quadrant is entered in the notes, and in any case it is one more tax on the mind. The Bausch & Lomb could only be read on azimuth, and so some of the readings had to be converted in the office to quadrant bearings. To obviate reduction as much as possible, the readings were entered both ways from north to south with this instrument. Although errors in quadrant may generally be detected in plotting, yet a little time in the field may save a lot of worry in the office, and it is important to be sure of the bearings of the traverse before you pick up your instrument. The following, I think, is a good method of ensuring accuracy: Having brought the instrument from the last turning point with vernier clamped and lower limb free, sight on the back point, seeing also that the vernier has not shifted, and after taking intermediates, set the forward point, then turn again on the back point and see that lower limb has not shifted since setting up, then set the vernier at the forward reading and note if the wire intersects the picket. It has happened that where the instrument has been carried clamped from one station to another, the bearings have checked out on closing the traverse, but owing to reading of one course having been entered wrongly, the work would not plot. We don't need to be told how to do work nearly as much as we need to have hammered into us that any neglect of system to effect a temporary saving of time will make us pay dearly in the end.

The loose-leaf system was employed and found satisfactory. Holders with strong springs and which fitted easily into the pocket were used. The field notes were drafted to scale. The scale first adopted was too small and necessitated the enlargement of portions. The northerly part of the work was drafted to a scale of 4 chains, and even this cramped the notes, as the exhibited sample will show.

Search was made for township posts along the coast. The Township of Harrison was surveyed thirty years ago, the surveyor now being deceased. The country has been burnt over, or both timbered and burnt, and a great many of the posts have been destroyed. The original blazed trees were found in some instances. We made a stadia survey of the coast which, based on the triangulation, produced a good result. Following the indentations of the shore, we surveyed 95 miles of main coast line, mostly in one township. The original coast line of Harrison is more or less imaginary, no actual traverse having been made in the original survey.

The islands were marked by either substantial posts or blazed trees, and the number of the island painted on the rock in white.

Roman numerals were used by instructions. This was done in advance by a party of two, who also kept a list of islands and posts, and described the unpatented islands, while the notes of the transit party following after furnished a final check and the position of the tree was tied in by distance and bearing. This was the work of a moment when the rodman was passing it. Any items overlooked in the proper order consumed a lot of time afterwards in picking them up.

(This Association is not responsible as a body for the opinions expressed in its Papers by Authors.)

THE FOREST AND THE LUMBERMAN.

BY E. STEWART, COLLINGWOOD, ONT.

Of all men the lumberman should be the most interested in the forests of the country.

The growing timber should be to him what the grain and root crops are to the farmer, and he should be just as solicitous that the land producing his timber may continue to reproduce indefinitely his supply, as the farmer is that his fields may from year to year continue to bring forth their accustomed yield.

The only difference is in the length of time required for the maturity of the product. In the case of agricultural crops, one year is sufficient, while in that of timber about one hundred is required.

This great difference of time involves many questions worthy of attention. In the first place, if, through some misfortune, this year's crop should fail to mature, or be destroyed, it may be made up next year by an abundant yield. If the supply in the forest field is destroyed to-day, as we have stated, one hundred years must elapse before a similar quantity can possibly take its place.

It is owing to a realization of this fact, perhaps more than to any other cause, that throughout the whole Dominion the forestry question is now receiving such marked attention. Pity that it has been so long delayed!

While it is in the interest of the country as a whole that a constant supply of timber for manufacture should be maintained, it is essential to the continuation of the business of the lumberman, and any regulations that tend to harmonize or bring into line the best interest of the public, who are the original owners of the timber, with the users or manufacturers of the product of the forest, should be welcomed by all.

If the latter, as is now generally the case, has only a limited period of time given him to cut the timber from his holdings, with no certainty of a renewal of his license, his interest does not lie in

nurturing a future crop in which he has no guaranteed interest, but rather in cutting and marketing everything that will give him a profit, at least so far as the regulations permit. I am aware of the diameter limit below which he is not supposed to cut, but remembering the condition in which cut-over limits are usually left, and the almost inevitable fire that follows, it is a question whether it would not in many cases be better that the whole of the timber were allowed to be utilized rather than consumed by fire.

It follows then that vested rights for a short period of time in timber property is opposed to the best interests of the country as a whole. The most unwise regulation that could possibly be conceived of is the one compelling the owner of timber licenses to cut his timber within a stated period, regardless entirely of whether there is a market for the product or not. The result of such a regulation must inevitably be that the lumberman will cut only the choicest of the timber and leave the limit in such a condition as to be almost sure to be swept over by fire, which will destroy not only the second-class, fully-grown timber, of less value than that which he has cut, but also the young growth as well. Apart from this, such a stimulus to over-production will result in a demoralization of the market in the meantime, with a consequent scarcity which must follow. Such a regulation is sure to be prejudicial to the interests of the lumberman, and also to the consumer of lumber in the future.

A view of the conditions on this continent and in Europe will convince anyone that nothing less than a timber famine awaits us in the future. Authorities of the highest standing in Europe are unanimous on this point, and quite recently Dr. Pinchot, who has charge of the forests for the Federal Government at Washington, has made the prediction that in twenty-five years, with the present rate of consumption, the merchantable timber of the United States will be exhausted. Statistics both in Europe and America show that notwithstanding the increased use of brick, stone, iron and cement in structural works, the consumption of wood goes on increasing year by year. Not only is the aggregate consumption in all civilized countries greater to-day than it ever was before, but the per capita consumption is also greatly increasing; that is, that the average use of timber by every individual is greater now than it ever was before. Such being the case, the demand enormously increasing, and the supply constantly diminishing, only one result can follow, and the country that to-day possesses valuable forests will profit by them to a greater extent in the future than ever heretofore in the world's history. The aim then should be not to encourage, much less to compel, the cutting of our forests, but on the

contrary, their conservation. I do not propose to go into the far-reaching effects of the denudation of the forests at the sources of water supply, and the consequences that must follow not only to water powers, but to the impoverishing of the agricultural districts.

These questions are of vital interest to this country, but my desire is merely to consider the practical question as to the relations of the lumberman to forestry. I know that at present there exists a prejudice against the holding, by individuals, of continued vested rights in the products of the public domain, but in the case of timber it will be well to consider the question before condemning the practice. The operations of the lumberman are generally on a large scale, and the employment of considerable capital is necessary to success in his business. In the early days, when timber was near at hand and in the proximity of settlement, a small mill, cutting within a radius of a few miles, could be profitably carried on, on a small scale. Conditions have now changed. The lumberman has to seek his supply often at hundreds of miles from his mill, and in order to be at all successful, his operations have necessarily to be on a large scale or failure will be sure to follow. Such being the case, it is necessary for him to possess a sure supply of considerable extent, and that will last for a number of years.

The lumberman as the employer of capital, as one engaged in the production of a necessity, should receive reasonable encouragement in the pursuit of his operations, and a close analysis of the situation will show that the interest of the lumberman and the public interest can be best met by such regulations as will encourage the former to use the products of the territory embraced within his license, so as to produce the greatest amount of timber, and not to produce an abuse by a hasty cutting away of his holdings.

Looking at the question from another standpoint, the Government of the country exacts a ground rent from the license holder, which continues so long as it is profitable for him to hold it, and the longer that he retains this license the more the Government receives from this rental. The Government also has it within its power to increase the stumpage dues, providing in the future it is considered that a higher royalty may be imposed. So both the amount received from the ground rent and from the stumpage will not be less, but greater, the longer the timber lasts.

Let us endeavor to view this question in a broad way. Looking at the map of Canada, we cannot but be impressed with the vast unoccupied area of timbered land which this country possesses. This is the property of the people, and it is wrong to consider it as exclusively owned by those of this generation. Our adminis-

trators should regard themselves as stewards not only of those living in the country to-day, but for future generations as well, and it should be the aim to look far afield and adopt only such regulations in its management as will conduce to the very highest benefits resulting from this product of nature to the country as a whole and for an indefinite period of time. Forest wealth differs from that received from the mines, inasmuch as the latter is definite and absolute in quantity, while in the forest we have entered a realm where life exists and where reproduction is constantly going on. Besides this, we have the functions of the forest as bearing on agriculture in its office as effecting water supply, and also in manufactures, owing to the power that water affords, especially in a rough country, like much of ours is, in driving machinery where coal can only be used for a like purpose by going long distances to obtain it.

It will thus be seen that our administrators are facing a problem requiring very great attention at their hands. We cannot slavishly copy the systems of management adopted by any other country in the world. Our conditions in many respects differ from those of any other country, not only on account of the vast area embraced; with great variety of climate, and consequently of production, but also on account of our system of Government being different in many respects from that of any other country. We have several provinces, each administering the products of the public domain within its boundaries as the people of those provinces think best. We have also the Federal Government possessing a vast territory of wooded land, which it administers, and it is a truism that the highest wisdom would be to utilize the product of the forest so as to be of the greatest use to the community as a whole.

Various opinions are entertained as to the systems the governments are adopting. Some would advocate the right of any citizen obtaining a farm anywhere on the public domain to obtain all the timber on it free. Others will be disposed to view the question differently; they will distinguish between the product the farmer obtains through his work in sowing the grain and cultivating the land to produce his crop, from that of his simply harvesting nature's crop, which he had nothing to do with in the way of producing. I think that the latter is the more logical, and that the products of the mine, the products of the forest, the products of our seas, lakes and rivers, belonging to the people as a whole, should not be given up by the Government unreservedly to anyone who desires to appropriate them. Besides, experience has shown us that where timber is conveyed by the Government along with the land in small quantities to farmers, it has not been in any sense to the best interests of the principles of forestry or to the best interests of the com-

munity as a whole. We have an example of this very close at hand, in the State of Michigan, where, following the system of Government in that country, the timber was given to the homesteader. The result was not in a wide distribution of the forest wealth or in the retention of this land by a great number of individuals. It was taken up not for the purpose of farming or even for using the forest product themselves, but in order to sell it, often for a very small amount, to large proprietors. In this way the Government parted with all right to pass any regulations regarding the timber, and the people received nothing for the forest product, and to-day vast areas in that state, instead of being utilized for agriculture, which was ostensibly the object of their being granted, are neither producing agricultural crops nor timber, but are simply barren wastes. If these areas had been granted as timber lands, especially where they were unsuited for agriculture, under a long term of lease with stringent regulations, that the timber should not be cut below a certain diameter limit, and the ground tax was, if anything, merely nominal, it would have been in the holder's interest to have practiced rational forestry methods in order that he might recut the same area at different periods in the future, and it can scarcely be doubted that if this had been done, a large portion of the pineries of that state would to-day be reproducing timber of the same varieties to the great benefit of that district of country.

I know the prejudice that is being industriously agitated to-day against large corporations, but that question is too large and intricate to engage in, in a paper of this kind. This much may be said, however, the industrial development of the country necessitates the formation of companies with large capital to meet the requirements of the age, and the fact is sometimes lost sight of that much of the money invested in those large corporations is furnished by people of only moderate means. It is impossible to-day, as I have already said, to conduct the lumbering business in the same way as it was done forty or fifty years ago, and there is no prospect of a return to conditions that will permit of the former methods. In the forests of the far North, in the forests of the West and Northwest, and in British Columbia, and even in those Eastern Provinces, it would be impossible for any person or company to successfully carry on the manufacture of lumber in the small way in which it was conducted years ago; and in the matter of pulp manufacture, for which no country in the world offers such a field as Canada, it is still more impossible to work successfully.

If these primitive methods were revived to-day, the result would simply be that the cost of production would be so increased that the consuming public would have to pay double or treble what they

now do under present conditions. Again, the large outlay in the way of plant which is necessary in order that the lumbering business may be profitably conducted, makes it necessary that before capital is invested in such enterprises, the owners must have some assurance of their being able to obtain for a lengthened period, a supply for their use. This in most cases can only be obtained by their having acquired certain rights of timber for a number of years. In Canada this has been done by the granting of leases or licenses guaranteeing them this right.

I think it will be seen from the foregoing that the system adopted in Canada of granting these rights to individuals or corporations who are engaged in the manufacture of lumber is in the line of modern development, and the question that we have now to consider is as to the best system to follow in granting these privileges. In the first place, the greater part of the merchantable timber of Canada to-day is growing on land which is not well adapted for agricultural pursuits, and in the vast majority of cases it would be more valuable if left permanently for the production of timber than for any other purpose. One of the first things that should be done in this connection is the exploration of these unoccupied timber districts, in order that those areas that are better adapted for the growth of timber than for agricultural purposes should be permanently set aside for timber. They should be carefully guarded from destruction by fire or otherwise When conditions warrant the cutting of timber on any portions of these, they should be granted for that purpose, the Government exercising at the same time the right to prohibit the cutting below a certain diameter limit, and to compel the operator to guard his district against fire.

I am not anxious to affirm that the license system is, per se, perfect in character, or that as the country grows older and becomes more thickly settled, that we may not be able to approximate in some degree to the systems adopted in several of the countries of Europe, but I do say that to adopt the intense systems of Germany or France to-day would be entirely impracticable here.

It has been my privilege to visit the forests of those countries and observe their management, and I have made it my business to see as much as possible of our own wooded regions, and I have concluded that the governments in dealing with this question should have constantly in view the following ideas:—

1st. To retain the *control* of their forests.

2nd. To preserve them from destruction.

3rd. To grant privileges under certain conditions for the use of the mature timber crop.

4th. To preserve for the future the growing, and lastly, to exact a reasonable royalty from those who may profit by any privileges that may be granted them.

Public ownership, public administration and utilization of our natural resources is now in the air, and (while there is something to be said in its favour) it is being carried to such absurd extremes by the popular agitator as to become a fad. Fancy the foreman of a lumber camp or river drive being selected by a political caucus, and as a reward for heroic work in a political campaign.

Between the extremes of individual ownership in fee simple of timber land, and that of the Government retaining and cutting the timber themselves, as is done in some of the German states, it seems to me that our license system is a happy medium—the Government retaining the ownership of the land and only granting the utilization of the forest product as it sees fit, and on the other avoiding the details of cutting and marketing it.

As I have said at the outset, a time of great scarcity of timber awaits us in the near future, and recognizing this fact, the ground rent charged should be placed at a very low figure, so as to permit the holder to retain his timber as long as possible. Any country having a supply of timber to-day, and which endeavors to husband its resources for the future, will be found when the time of scarcity arrives, not only to have acted with prudent foresight greatly in its own interest, but also to have at the same time acted the part of a world's benefactor.

There is a story of an old miner who, having prospected through all the Western States, always moving West as civilization approached him, at last finds himself at Nome, Alaska, with the Pacific Ocean in sight. Even here his old enemy overtakes him, and with the force of habit he exclaims that this country, too, has become too civilized for him, and that he will have to go farther West.

The sound of the lumberman's axe, first heard in this country on the banks of the St. Lawrence, was soon carried up the Ottawa, then across to the regions surrounding Lakes Huron and Superior, then to the shores of Lake Winnipeg and beyond even to the Rocky Mountains, till it is now resounding through the great timber fields of British Columbia, where the Occident and the Orient meet, and are both holding out their hands for the products of these forests.

We, like the miner, fail to realize that we have reached our last West; that nature, so prolific to this country in this respect, has no more virgin fields to offer, and that the only means by which a supply can be maintained to meet the enormous demands of future years is by husbanding the resources of the territory which we are now exploiting.

Discussion.

Mr. Stewart—Mr. Chairman and gentlemen: I feel I owe you an apology for bringing a paper before you that is not professional, and still I am not altogether to blame. My name was put down during my absence. I am not finding any fault for that specially, but still I found when I came home to this country that I was down for a paper on "Lumbering on the Pacific Ocean." I had not such a paper, had not time to prepare one, but I communicated with the President and he seemed to wish to have a paper of that kind read and said it had been done before. I know it has been done before, and it used to be done in the old times and I always opposed it. I think it is rather out of place to introduce things that are not professional here. However, I have a paper on "The Forest and the Lumberman," and although it may not be of interest professionally it is on a subject that interests most of us individually.

Mr. Stewart then read his paper which was received with applause.

Mr. Davis—Mr. President, the reader of this paper expressed a doubt about the advisability of reading a non-professional paper before this Association. I hasten to say that in my judgment Mr. Stewart shouldn't hesitate for a moment to read such an excellent paper on this very important subject of the conservation of our forests, before this Association, and furthermore that this Association should not hesitate for one moment to accept that paper and print it in the proceedings. Who comes against these forest limits like the surveyor? Who knows as well as the surveyor the extent of these boundless limits? And if the Government, which is now wideawake and alert as to the necessity for conserving these limits, wants advice, to whom can they go with more assurance of reliable data than the surveyor? I think it is something the surveyors should understand far better than they do. And with the knowledge they will have after reading this paper carefully, I am sure they will be more interested in the conservation of our great resources in the forest than they have ever been in the past. I take much pleasure in moving that the thanks of this Association be tendered Mr. Stewart for his paper, and that this paper be published in our proceedings.

Mr. Moore—Mr. Stewart gave us a very good paper and he has told us it is the irrepressible lumberman that is denuding the country of its timber; and while they are going ahead eating everything out of a face from east to west, from the St. Lawrence right on to the Great Lakes, they have hardly got over the ground before we have the individual farmer who has some nice elms on his farm, a few pines and some oaks and maples which the lumbermen have not a right to get after, cleaning them out and bringing them into the market. In the east we have a cooperage company, and these farmers are bringing in their elm and their ash to this company, and what the fires and the lumbermen have missed, these chaps are coming along and cleaning up. Where in the world are we going to be anyway? Anybody who saw the views which Mr. Mitchell gave us last night would see at once that what made possible those fine water power plants of Europe was the forest which prevented the rapid melting of the snow and kept up the streams in that mountainous and rocky country. If we do away with our forests the water is going to get away, and where is more water coming from? Down east you will see stream after stream upon which seventy-five years ago little mills used to run all summer long. To-day those streams are dried up by the end of May because all the trees have been cut on the uplands and the water has got away. Something surely has to be done and must be done to conserve, to keep the fire out and to keep trees of a certain size from being cut, and some effort made to conserve the forests. It is a surprise to anybody coming along the Canadian Pacific Railway to see the large amount of ties, poles and logs. I hadn't any idea that in old Ontario there was so much timber left to be brought out this last winter, and we have the farmers drawing their logs to the sawmills from every quarter, they are cutting down and sawing up and shipping and destroying the lumber all over the country.

Mr. Jones—There was one point in the paper that was rather a surprise to me, and that is that the consumption of lumber at the present day is still on the increase to the extent that Mr. Stewart says it is, notwithstanding the introduction of steel, concrete, brick and stone in the place of lumber. Take some few instances. Look at the bridges that are now made of concrete and steel which were all made of lumber before. Every little village has ceased to put down board sidewalks, and there was an awful amount of lumber used in board sidewalks alone. You don't see any being put down now at all. If there is a village of 100 inhabitants they put down concrete sidewalks, there is no lumber being used for that now at all. The buildings that were made of wood are now being made of concrete and steel. As I say it was a surprise to me to find out that the consumption of lumber was still on the increase. I was almost

satisfied that the consumption was on the decrease owing to the introduction of other materials as a substitute for lumber.

Mr. Stewart—I would like to tell Mr. Jones that it would be well worth his while, if he wishes to inform himself on that point, to read a work by Dr. Fernow on "Economics of Forestry." I think in that there is a diagram showing the per capita used. However, unless it has changed within the last three or four years, the per capita used is greater than ever before in Canada and in the United States and also in Continental Europe. Relatively it is not in comparison. There is more stone and brick and cement and that kind of thing used, but, as I think Dr. Fernow says, with the advance of civilization and the more uses to which it is applied, man, notwithstanding that he uses a great deal of brick, stone, cement, iron and steel, uses more wood to-day per capita. Unless within the last three or four years that condition is changed, this is the case.

The President—I think there is no change. I think the enormous construction of railroads has caused the increase in the use of wood for ties and trestles.

Mr. Stewart—Not only in the use of ties and trestles. I was talking with Senator Edwards on that very question, and I said, now, there is one thing, the enormous use of cement in structural works in buildings will make a considerable difference in the use of timber. He said, I built a factory in Ottawa, and I used just as much lumber in building that as I would if I had built it of wood. The casings had to be all built of timber—they may use something else later—and, he said, that lumber was no use afterwards, it was filled with mortar and stuff.

Mr. Davis—I don't think there is a question about the truth of the statement, Mr. President. Look about in all our towns or cities and see the wonderful development in the great areas that are being filled up principally of framework in the outskirts, and then take our general construction of railways and all sorts of construction. There is a vast amount of increase of lumber used year by year. I think it must be increasing very rapidly notwithstanding the fact that there is a falling off in other respects.

Mr. Stewart—A few years ago President Roosevelt called a Forest Convention in Washington, in which we spent a week. There were representatives from nearly every branch of industry in the United States; the railways and mines were all represented; the lumber industries were represented, and there was a statement made by one of the mine engineers. He had statistics to show the timber used in mines. I hesitate to state what I think he said, but I know the amount of lumber used by the mines in comparison with

the railways was in favor of the mines. Then the railway men came on and spoke of the increased use of lumber, and notwithstanding the enormous quantity of ties they said when they came to the bridge and trestle work, look at the timber we use in the false work before we commence to put up the other works. It was really remarkable the way timber was used in so many different ways.

Mr. Kirkpatrick—I will second Mr. Davis's motion. I am sure whatever Mr. Stewart writes will be worth reading.

The President put the motion, which on a vote being taken, was declared carried.

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FUTURE PROSPECT FOR ONTARIO LAND SURVEYORS IN THE MINING DISTRICTS OF NEW ONTARIO.

BY C. H. FULLERTON, NEW LISKEARD, ONT.

In sticking to the title of this paper, one must necessarily, to some extent at least, possess the foresight of a prophet, in order that his prognostications come at all near the truth. One thing is certain, if there is no future for land surveyors in New Ontario, they must certainly find that future in some other province, that is, so far as land surveying purely is concerned.

While I am limited to the mining districts of New Ontario, I take it that I am not bound to ignore the opportunities the surveyor may have in other industries that may, to a large extent, go hand in hand with, or have their origin in mining. The mining industry promotes agriculture by making a market for farm products; it is a stimulus to manufactures, for the same reason; it is the cause of water-powers being developed, of towns being established, and of railways being built. In each of these, there are opportunities for the land surveyor, more particularly if he has had training in some technical school or university.

There are two stages to a mining camp—the boom stage and the settled stage. In the boom stage, there is always demand for Ontario land surveyors; every prospector, promoter or newly-formed mining company that employs a surveyor requires the work done with the greatest expedition possible. It is like a man who sends for a physician; he wants him immediately, or he may not need him at all. The prospector, or promoter, may have a deal on for claims he owns, or for others held under option; a nicely colored plan of his properties he regards as an aid in disposing of his holdings; if he cannot get this before his option expires he may not take it.

The result of this is, that the surveyor naturally will endeavor to make hay while the sun shines. Unless this is his first boom, he will know that in a few months at most, the great excitement will be over, most of the claims will be surveyed, and all

the rock and muskeg will be staked. He will, therefore, secure several assistants, and perhaps buy more instruments and equipment. He will now be in a position to do a large amount of work on short notice.

When the boom is over, and the second stage begins, most of the surveyors must withdraw, as a very few surveyors can then do the work, the prices are now apt to be cut. To get work the surveyor, with a large staff and equipment, is for a time tempted to secure work at a price that may pay little more than actual expenses. If the camp proves a failure, the crowd gradually fades away, and there will be but an odd claim to survey, for some whose faith in the camp remains unshaken.

If it is a success, and the Cobalt camp is an example, surveyors will still be required, some claims may be re-surveyed, boundaries of others have to be retraced in whole or in part, underground workings have to be connected with the boundaries on the surface, the land surveyor is required for these, and he is available to perform all the underground surveys, if necessary.

The development of the water-powers that go hand in hand with mining furnishes work for land surveyors. The surveyor has to make a plan to accompany the application to the Government for a lease, and being on the ground, has the first opportunity to do the engineering work connected with the development.

The towns that spring up as a result of mining are subdivided by the surveyor, and he has the first chance to do the municipal engineering work of the new town.

Railways may be located and built, either steam or electric, or both. The services of the surveyor are required to make the right of way plans, and he is ready to do the engineering work.

Besides all these, there is a certain amount of surveying to be done for the farmer, as in New Ontario: mining and farming may be carried on side by side. In addition there is sometimes work done under instructions from the Government, and if it is urgent the man on the ground very often gets the preference, as he is usually in a position to do the work at shortest notice.

Then, again, there is the possibility that the surveyor may become interested in mining properties that prove valuable, in which case he may lay aside the transit and chain. There are also plenty of other investments in a new country, but in a mining district it is difficult always to hit upon the psychological moment for either selling or buying.

I might just here give a few figures to illustrate the past and present, and leave you to judge of the future for surveyors in that part of New Ontario tributary to the T. & N. O. Railway. In about five years there have been in this territory, at one time or another, thirty surveyors, to my knowledge, engaged in the survey of mining claims, besides the assistants that were employed by them. To-day there are ten surveyors, five of whom, I believe, are engaged purely in surveying, the balance partly in surveying and partly engineering, but all busy. As the territory I have indicated is but a small part of the whole, I think you will agree with me that this is evidence that the future of the land surveyor in the mining districts is not to be feared.

I might at this point suggest a change in the Mines Act, that I believe has not been discussed at our meetings. This change would be a great convenience to prospectors and a decided advantage to surveyors. Stakers of mining claims are required by law to do certain development work in order to hold them—a stated amount each year. Now, if the survey of the claim were accepted by the Government at a fixed price in lieu of work performed, it would be welcomed by both the surveyor and the prospector. I believe this is done in British Columbia. This plan would be of material assistance to the Mining Recorder, and prevent much confusion in the recording of claims, and avoid many disputes; it would also provide records for the Government without additional cost to the province.

In conclusion, when it is remembered that but a few years ago New Ontario was a wilderness, and that as yet it is scarcely more than scratched; when we consider the areas yet to be opened up, the railroads that are being built, other railroads for which charters to build are being applied for, and that must be built, together with the vast territory that each will open up, I think we can safely say, here lies the heritage of the Ontario Land Surveyor.

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SURFACE TREATMENT FOR DUST LAYING AND ROAD PRESERVATION.

BY W. A. McLEAN, PROVINCIAL ENGINEER OF HIGHWAYS.

Dust prevention has long had a recognized place in urban communities of Ontario, the watering cart during dry summer weather being the remedy commonly applied with moderate success. At best, however, there are intervals when temperature and breeze are too nimble for the water supply, and the man on the watering cart is deluged with complaints proportionate to the dust that descends on pedestrians and adjacent lawns. When an adequate service is available, and the driver uses intelligent discretion as to the amount of water applied, the sprinkling wagon is an agreeable means of subduing dust—but very rarely is the right combination of service and intelligence applied to the work, with the result that, as a means of subduing dust, water sprinkling has not been effective.

The oiling of roads in California, Pennsylvania and other petroleum regions has been a matter of rumor and experiment for some years, but it was not until 1909 that a serious test was made in Ontario, when a residium of petroleum with a paraffin base was used on the streets of Toronto. Vox populi was at once heard in complaint and objection. "The odor of the oil was offensive, and the oiled mud ruinous to paint, clothing and carpets." But the disagreeable odor passed away in a few days. A small quantity of oiled mud or dust was found no more injurious to clothing and carpets than was a large amount of dry dust. The dust nuisance was remedied to an extent unknown before on macadam and earth roads. Citizens no longer inhaled clouds of dust. Continued experience in 1910 in Toronto, and in other parts of the province, has confirmed the use of oil as a success, a measure of comfort and sanitation, in which the benefits outweigh the objectionable features.

A new factor, the motor vehicle, has of recent years entered the domain of traffic, and has placed new demands upon the public highway. Ten years ago traffic on the roads of England had only 5 per cent. of motor vehicles, while last year 70 per cent. was motor

traffic. The number of motor vehicles in Ontario is increasing rapidly, farmers are now among the users, and it is evident that the use of the public highways by this new mode of travel and transportation has tremendous possibilities. Already the motor traffic on some of the roads of the province has brought the dust problem into association with country roads, with attendant discomfort to users of the road, and injury to crops, fruit, lawns and houses.

The scattering of dust by rapid and frequent motor traffic is a serious injury to the road itself, in that the dust is a necessary bonding material for the stone composing the road, and when this is removed, the road "unravels," roughens and deteriorates. Present motor traffic in some cases is now demanding dust-laying treatment; and future traffic will, in the writer's opinion, require it upon a considerable mileage of heavily travelled roads in the province as a matter of preserving them from destruction.

Dust-laying treatment may be little more than a palliative in which the dust is prevented from rising, and remains as a cushion coat over the stone. Or treatment may go further, and may provide for a stronger and tougher road-surface that will resist wear by bonding and protecting the stone. As palliative treatments may be considered the use of the old sprinkling wagon, of calcium chloride, oil emulsions and petroleum, oils with paraffin base. With the protective treatments may be included the use of asphalt and asphaltic oils now being so largely tested in the United States, and the several tar treatments adopted as standard practice in England and Scotland.

Calcium chloride in solution is merely an improved method of water sprinkling. A salt with an affinity for moisture, the principal effect of calcium chloride is to retain the moisture of the atmosphere, thus lessening the necessity of so frequent watering. The effect, however, is temporary, and its use is limited.

OILING ROADS.

To oil roads successfully requires a thorough understanding of the oil used, its constituents and method of preparation. A petroleum oil is generally employed, but some of these, such as the California oils, have an asphaltic base, while those of Ontario and Pennsylvania have a paraffin base. Asphalt is a binder, while paraffin is not, and in an asphaltic oil will destroy the binding properties of the latter. While heavy asphaltic oil, free from paraffin, may be used within the body of the road, or sprinkled over the surface, paraffin oils can be used only by the latter method.

Paraffin oil such as that used in Toronto may be sprinkled from an ordinary watering cart, and on country roads during the past season, crude, home-made distributers attached to common water wagons were made from perforated gaspipe, with success. The oil should be applied to the road in warm, dry weather. Two applications early in the season, followed by two or three later, according to the weather, have been found sufficient to keep down the dust, using for the season on a country road about 3,500 gallons. About 1,500 gallons per mile should make the first two applications. The cost varies according to local conditions, but has been about 4 cents a gallon, and 1 cent for applying.

Asphaltic oils may contain a varying percentage of asphalt up to about 80 per cent. Great care is needed in putting it on the road, to avoid splashing and inconvenience to traffic. Oils with a high percentage of asphalt have to be heated to apply to the road. Special sprinklers are desirable, with the distributers close to the road surface to avoid splashing. One-half of the road only should be oiled at a time to prevent inconvenience to users of the road. Immediately, or within a few hours after applying, the surface should be sprinkled lightly with clean, coarse sand or stone chips. Before applying, the road should be swept clean and sprinkled to slightly moisten the surface, but the weather should be dry. If rain approaches, be sure to get the oil covered and partly absorbed by the screenings, otherwise the oil will be splashed out to the roadsides. One-quarter of a gallon of oil to the square yard in each of two applications will last one season, and in some cases more.

Oil emulsions in which alkali or acid chemicals are used to "cut" the oil are more easily applied, but their effect is temporary.

The cost of two applications of asphaltic oil in two applications each of one-quarter gallon per square yard is given by the chairman of the Massachusetts State Highway Commission, as follows:

	Cents.
Cleaning and sweeping	0.56
Patching old surface	.16
Oil	3.19
Heating oil	.31
Delivering oil	.38
Distributing oil	.29
Furnishing sand at road	1.65
Spreading sand	.73
Watering	.12
Rolling	.02
Supervision	.25
Total per square yard	7.66

ASPHALTIC BINDERS.

In American practice, one of the most recent departures is the use of heavy asphaltic oil as a road binder, applied by the penetration process. That is, over the main road foundation is spread a surface coat of 1½ or 2-inch stone, about two or three inches in thickness. After being once rolled, the heated asphalt oil, containing about 80 per cent. asphalt, is poured into the interstices of the stone. Over this is spread a light coat of stone screenings, and the steam roller completes consolidation. A paint course of asphaltic oil is then applied, and this is followed by a final dust coat of stone chips, well rolled in. By the same method, lake asphalt, fluxed with oil in the usual manner, is employed in the road.

Lake asphalt fluxed with oil may be heated and mixed with stone, but the mixing process is found too expensive for country roads. The penetration method itself is only suitable for roads of heavy traffic, in which the cost of repair would otherwise be large, because of constant motor or heavy team traffic.

The cost of bituminous pavements in New York State last year was approximately 20 cents per square yard for each inch in depth of the penetrated matrix. The stone was usually penetrated to a depth of two or three inches. This class of treatment was used principally on state road metalled to a width of 18 feet.

TARRED ROADS.

The tarring of roads for preservation and dust prevention has become the standard practice in England, and is applied in several ways, which may be classified as (1) tar painting or spraying, (2) tar grouting or penetration, (3) tar macadam, (4) tar matrix.

The tar in England is coal gas tar, and is of a more uniform quality than that produced in this country. Tar varies greatly according to the coal used and process of gas manufacture in which the tar is obtained. This lack of uniformity has, in part, been responsible for much of the inferior tar macadam roads in Ontario, and for the feeling among engineers that its use is too uncertain a quantity.

In general the tar should be refined by heating to drive off volatile oils and other ingredients are added. After refining, tar for spraying may have added to it a quantity of linseed oil to cause it to flow more smoothly. The tar painting or spraying method is a surface treatment, and may be by hand or by machine, the tar being spread over the surface of a macadam road in a thin layer and a light coating of stone chips or fine gravel rolled in.

The tar grouting process is similar to the penetration method of the United States. The tar is heated, fluxed with oil, and is then poured into the interstices of a surface coat of broken stone. When the tarring is finished, the surface is sprinkled with a coat of stone screenings or clean gravel, and is thoroughly rolled; then is completed with a paint course topped with screenings and rolled. The cost of a grouted surface of tarred stone in English work is about 42 cents a square yard.

In tar-macadam the stone and tar are hand-mixed, both stone and tar being heated. The mixture used for this purpose usually contains tar, pitch and creosote oil. The proportions are about 50 pounds of pitch, 12 gallons of tar, 2 gallons of creosote oil, and one ton of broken stone. The pitch is broken into fragments and put in the tank, the tar is then poured in, and when these reach boiling point the creosote oil is added. Constant stirring is necessary until a uniform consistency is reached. The stone having been heated until quite dry, the tar and stone are mixed and turned over several times, and the mixture is then spread on the road. The material is usually put on in three layers: the bottom layer 3 inches thick of 2½-inch material; the second layer 2 inches thick of 1½-inch material, and the top layer 1 inch thick of ¾-inch material. The last course is dusted over with coarse, clean sand, and is rolled until consolidated. The cost is usually about $1.00 a square yard, but this is found too expensive for country roads.

The tar matrix process is one in which a fine grade of gravel or broken stone is mixed with refined tar, and is spread to a depth of 1½ or 2 inches over an old roadbed or well-rolled stone foundation. On this is spread a 3-inch layer of 2½-inch stone, and this is rolled until the tar matrix is brought to the surface, thoroughly sealing it. This is usually followed by a "paint" course and a dusting of screenings to seal the surface completely. Or, instead of being placed below, the tarred matrix is spread over the new stone and is rolled down into it. And a third method, the "Gladwell" system, is a combination of the two, an intermediate layer of broken stone being sealed from above and below with the tarred matrix.

SPECIAL MATERIALS.

The demand for a road material that will be dustless and durable has caused a large number of patented materials to be placed on the market. Roseate qualities are claimed for many, and while some are clever and promising compounds, the important test—the time test—is one which has yet to be satisfied by all, for experience is necessarily very limited. Glutrin is prepared from a waste of

wood pulp manufacture, a dark brown liquid, which is diluted with water and sprinkled from an ordinary watering cart. Tarvia is a preparation or blend of tars designed to meet the need of a standard and uniform grade of refined tar. It has been used on Beverley Street, Toronto, in several ways, with a view to testing its value. Westrumite is said to be an emulsified asphalt or asphaltic oil. Rocmac is a liquid which, mixed with powdered limestone, produces on exposure to the atmosphere, silicate of lime. Several test sections have been laid in the province, and its action in the road is of an interesting kind. Good results are reported from England and Scotland, but with many other materials, its permanence has yet to be determined.

In general, the situation at the present time has shown the value of petroleum oil with paraffin base for easy application as a dust palliative. Petroleum oil without paraffin and with an asphaltic base can be applied to make a more permanent dust preventive, and, containing a large amount of asphalt, may be used as a protective coat or as a grout. Some grades of lake asphalt applied by the penetration or grouting process have a high value in making, at a reasonable cost, strong bituminous roads for heavy country traffic, free from dust, and reducing the cost of maintenance. The use of tar is a promising field in Canada, as in England, and affords an opportunity of being less dependent upon patented materials and the larger asphalt and oil trusts.

The quality of stone used in the road has a marked influence upon durability, no matter what binder may be employed. Western Ontario has only limestone, while some parts of Eastern Ontario are better favored with granite and the more durable rocks. Field stone, where used, should be selected to remove inferior and decayed limestone and sandstone. For roads of heavy traffic, much would be accomplished by securing for the wearing surface a three or four-inch coat of trap or good granite, but at the present time the cost of securing these would appear to be beyond reach.

Discussion.

The President—Does any gentleman wish to make any remarks in connection with this very interesting paper?

Mr. Gibson—Mr. President, I am very much pleased with the paper. It will be very useful for reference. I have much pleasure in moving that it be received and printed in the proceedings.

On the motion being seconded it was adopted.

(This Association is not responsible as a body for the opinions expressed in its Papers by Authors.)

THE CALENDAR.

BY DR. W. F. KING, C.M.G.

The calendar has been defined as the system of division of time into periods adapted for the purposes of civil life. In this broad sense it includes not only the counting of days and months and years, but also the division of the day into hours, etc.

There is much interest in the study of the subdivisions of the day from the historical standpoint, the origin of the hour, the minute and the second, and the gradually developed means of making these divisions available for use leading up to the modern high degree of accuracy in the determination of time.

On the present occasion I intend to confine my remarks to the calendar as having to do with the day, and longer divisions of time; this indeed being the more usual definition of it.

I suppose in the primitive condition of mankind, hunters or shepherds, in countries where the extremes of heat or cold were not very severe, might be not greatly concerned with the seasons of the year, but begin by counting the days merely, like Robinson Crusoe with his notches on the post, but they would very soon find that it was difficult to keep track of events of importance to their communities in this way, and the phases of the moon, affording a unit of time, as visible as the sunrise or sunset, and covering a longer period, would be resorted to. Hence the lunar month, from full moon to full moon, is found as a measure of time in most, if not all, of the ancient calendars, and has survived to our own time in a modified form.

With the rise of agriculture came the need for defining the seasons for seeding and harvests, etc. Thus the solar year came into use, but not immediately, I think. The proper seasons would be determined by observation, presumably by the priestly class, of the appearance in the sky of particular stars, of the equinoxes, etc., but this would not necessarily involve a reference of the calendar to these epochs.

Dates were for a long time recorded by reference to the occasions of kings or to the annual election of magistrates, as the Roman consul, or even by generations.

In the ancient chronology the year was the year of the twelve Lunar months, or 354 days, or with the Romans 355 days, which was increased to 377 or 378 days when it became necessary to adjust it with regard to the solar year, as I shall explain further on.

It is said that Eratosthenes, about 200 B.C., first perceived the advantage of measuring by solar years, but the lunar reckoning continued long after his time.

When the solar year came to be generally used as a measure of time, different nations numbered them from different epochs. Thus the Romans counted from the founding of Rome, 753 B.C. It was long before the general agreement upon the Christian era was arrived at.

As for the subdivisions of the year, in a settled community the changes of the seasons touch human life and human interests much closer than do the changes of the moon. Thus the solar calendar ultimately had to take the place of the lunar, though the latter could not altogether be discarded, as often festivals of ancient date, whose dates could not be easily changed, were timed by full or new moon. The problem arose now to reconcile the solar and the lunar dates.

The average lunation, from new or full moon to new or full moon again, is about 29½ days. The solar year is about 365¼ days. There is therefore not a whole number of days or of lunar months in the year. Twelve lunar months make 354.5 days nearly, falling short of the solar year by about 11 days.

The incommensurability of these periods caused much trouble to the early chronologists, and the devices used by the different nations and at different times to form a consistent calendar based upon both the sun and the moon have been very numerous. The final results, so far as our civil calendar is concerned, has been to discard the moon altogether, while retaining the month, which has been increased about a day on the average, so as to divide the solar year into twelve months of approximately equal length.

The first approximation to the length of the year was 365 days, but it was known in very early times that the year was about six hours longer. Reckoning the year at 365 days, it was found that the summer solstice fell later each year. As the differences amount to about 12 days in 50 years, it was soon very perceptible.

The ancient Egyptians estimated the true length of the year at 365¼ days, but made their civil year 365. It is said that they purposely omitted to provide any leap year correction, and allowed public festivals, though recurring at the same date, to run through the entire natural year. Geminus of Rhodes says: "They do not wish the same sacrifices to the gods to be made perpetually at the same time of the year, but that they should go on through all seasons of the year, so that the same feast may happen in summer and winter, in the spring and autumn." I suppose they wished to avoid favoring one god more than another, and thereby provoking jealousy.

Consequently after 1,461 of their years, or 1,460 years of 365¼ days, the festivals would come back to the same place in the seasons, as they supposed. This period of 1,460 years is called the Sothic period. Sothic meaning the "dog star," or Sirius. The period began with that year on the first day of which Sirius rose with the sun.

The Astecs, at the time of the Spanish conquest of Mexico, had a calendar in which the year was given as 365 days, but at the end of 52 years they made a correction of 13 days, and at the end of the next 52 years a correction of 12 days.

Thus they allowed 25 leap years in a 104 years, making the average length of the year $365^{25}/_{104}$ days, or 365 days, 5 hours, 46 minutes, 9 seconds, which is only some 3 minutes, 39 seconds shorter than the true solar year. The error of their calendar was therefore only about 4½ hours in a century.

In the subdivision of the year the Astecs used a system not based on any astronomical fact. They had 18 months of 20 days each with five extra days, which they considered unlucky and did not attach to any month. Each month was divided into four weeks of five days each.

This system was somewhat similar to that of the ancient Egyptians, who also had the five extra days at the end of the year. They, however, divided the 360 days into 12 months of 30 days each. The Greeks divided the 30-day month into three weeks, or rather decades, of 10 days each. A similar division was also adopted in France at the time of the Revolution.

The Peruvians of the era of the Spanish conquest were, according to Prescott, less advanced in their astronomical knowledge than the Mexicans. They divided the year into 12 lunar months, which would fall about 11 days short of the solar year; so they rectified their year by solar observations made by means of the shadows

of high columns, by which they determined the times of the solistices and equinoxes. From Prescott's account it would appear that they had no systematic calendar by which the dates of those phenomena were determined beforehand. It was the duty of the priests to adjust the dates periodically, presumably every quarter or half year. We may note that an analogous arrangement prevailed in ancient Rome, where the intercalation of the extra 11 days to make the year and month correspond was left in the hands of the aediles. In Rome, we are told, this power of adjusting dates was used for political purposes, by arranging the dates of the elections at will, with resulting confusion in dates, until the reformation of the calendar by Julius Caesar.

Little seems to be known of the other divisions of time among the Peruvians. As with the Mexicans, not only their ancient civilization, but also almost altogether the very records of it, were swept away by the Spanish conquerors.

I have dwelt at some length on the astronomical knowledge of these American nations, from the interest there is in considering a civilization which so far as we know was independent of the civilization of Europe and Asia.

Returning to the Old World, I do not wish to take up time discussing the development of the calendar among the different nations. It may be remarked that the lunar calendar is now quite obsolete with one or two exceptions, the principal of which is Mahometan calendar, in use in Turkey, Persia, Arabia, etc. This calendar is purely lunar, the year being twelve lunations, or about 354½ days in length. No intercalation is used to bring it into accordance with the solar year.

The Hebrew calendar has years each of which is an exact number of lunar months 12 or 13, there being in each cycle of 19 years 12 of the shorter and seven of the longer years. As will be explained afterwards, 19 solar years almost exactly coincides with an exact number of lunar months, namely 235. Hence at the end of the cycle of 19 years, the beginning of the year recurs at the same season.

It may be of interest to give a brief account of the development of the calendar we use in modern times.

The civil calendar comes from the Romans. With them, in ancient times, the year began with March. A result of this may be traced in the names of the months. September, October, November and December, as the names imply, were originally the 7th, 8th, 9th and 10th months. July and August were originally the 5th

and 6th months, Quintilis and Sextilis. Their names were changed in honor of Julius Caesar and Augustus, respectively. February was the last month of the year, which accounts for its use as the month in which the additional days were added to regulate the calendar.

In the first systematic calendar the months were 29 and 30 days in the length alternately, making 354 days in the year, but one month was increased in length by one day, for a superstitious reason. Thus the year had 355 days, nearly 10¼ days short of the true length. To correct this, every second year was increased in length 22 or 23 days alternately. These days were inserted between the 23rd and 24th of February. The reason for inserting them in this particular place in the month I do not know; it seems a very complicated system of adjustment. However, this complication is quite in line with the clumsy method of reckoning the day of the month, which I shall mention presently. The Romans evidently were not practical in everything.

They apparently started with the idea of making the month begin with the full or the new moon, for the length of the lunation being 29.53 days, 12 lunations, are equal to 354.36 days and their 355 days year exceeded this by only two-thirds of a day. But the accordance of the calendar with the lunar month was upset every second year by the intercalation of the 22 or 23 days. Thus they threw away any advantage there might be in the accordance with the moon, but it was not until the time of Julius Caesar that the seemingly obvious step was taken of abolishing the use of the lunar month, and regulating the year entirely by the sun.

In the original Julian calendar the months were made alternately 31 and 30 days, except February, which had only 29. March had 31, April 30, May 31, June 30, July 31, August 31. Every fourth year an additional day was given to February, thus making the years of the same length as we have them now but using a simpler distribution than ours of the days among the various months.

It seems that at the first the leap year intercalation was misunderstood by the pontiffs who had charge of the calendar. They intercalated a day every three years instead of every four, thus throwing the calendar again into confusion.

This necessitated another reform in the reign of Augustus.

Since Julius Caesar, as the reformer of the calendar, had been honored by naming one of the months after him, it was thought proper to do the same thing for Augustus, and the month Sextilis accordingly had its name changed to August.

In the Julian arrangement August, October and December had 30 days each. The first of these having been appropriated by August, it was necessary to give it 31 days to make it equal to July. Then to avoid having 31 days-months together, a day was transferred from September to October and one from November to December. The day added to August was taken from February.

Hence the present irregular distribution of the days in the several months. Had Augustus been born in September or May instead of August, this trouble would have been avoided, and the little rhyme with which you are all familiar, beginning, "Thirty days hath September," would never have been written.

I referred a short time ago to the clumsiness of the Roman rule for designating the day of the month. This was as follows: The first day of each month was called the calends of the month, The 7th of certain months was called the nones, because they came nine days before the ides. The 15th or the 13th was called the ides. The days were counted back from these epochs, counting inclusively. Thus the 10th of March was the 6th day before the ides of March; the 10th of December was the 4th day before the ides; the 14th of January was the 19th day of the calends of February, and so forth.

At the time of the Julian adjustment the date of the vernal equinox was the 25th of March.

Now Caesar's calendar made an intercalation of one day every four years. This is equivalent to making 365.25 days equal to an average year.

The true length of the year from the vernal equinox to vernal equinox again, or the tropical year as it is called, is about 365.2422 days.

Hence, if an equinox occurred at noon of March 25th of one year, it would occur the next year at $365.2422 = 365 + .2422$ days, or nearly 6 hours after noon of March 25th, in an ordinary year, or $366 - 365.2422$, or .7578 days, or over 18 hours before noon of the 25th, in a leap year.

On the average of four years it would occur .0078 of a day, or about 11 minutes earlier each year.

In about 128 years it would recede one year. By the year 325 A.D. it had receded over three days, bringing the equinox to March 21st. In this year was held a General Council of the Church at Nicaea, commonly called the first council of Nice.

At this council a rule for the determining the date of Easter was adopted.

This rule was that Easter must be celebrated on the first Sunday following that fourteenth day of the moon, which fell on or next followed the 21st of March. The 21st of March was fixed upon as the determining date, because that was then the date of the vernal equinox, the beginning of spring, typical of the Resurrection.

The reference to the full moon (or rather, to be exact, the 14th day of the moon) came of course from the historical connection of the feast with the Jewish Passover.

This was evidently intended to be a perpetual arrangement, but the prelates who framed the rule overlooked the fact that the existing calendar having the year of 365¼ days, the equinox would not continue to occur on the 21st of March.

By the year 1582 A.D. the equinox had retrograded to March 11th. It had by that time come to be recognized that more than a theoretical inaccuracy was involved, that very considerable inconveniences in the ordinary affairs of life would in time result from the change in the dates of the different seasons, if the error of the calendar was allowed to accumulate.

More accurate astronomical data were by this time at hand and it was found that the error of the Julian calendar was about three days in 400 years.

Pope Gregory XII. in 1582 ordered ten days to be suppressed in the calendar, so as to bring back the equinox to March 21st, the date at which it stood at the time of the council of Nicaea. He also decreed that the leap year intercalations should be omitted in the final year of each century, except every fourth century. That is, when the number of the year is divisible by 100, but not by 400, it is an ordinary year. When divisible by 40 it is a leap year.

There are 97 leap years in every 400. The length of the year in the Gregorian calendar is therefore 365 97/400 days, or 365.2425 days.

The true length of the tropical year at the present time is 365.24221259 days. From the effect of the mutual attractions of the bodies of the solar system, the length of the year is at the present time decreasing at the rate of 0.595 seconds per century.

Astronomical theory tells us that in the course of time this decrease will cease, and the year begin to increase. If the Gregorian

rules were supplemented by another, which is in close analogy with them, that the year whose number is divisible by 4000 should not be a leap year, the excess of the average of the calendar years over the astronomical would be reduced to .0029 — 00025 = .0004 of a day, making only one day of error in 25,000 years.

The Gregorian calendar was at once adopted by the principal Catholic States of Europe, but not by the Protestant States until much later, when they were forced to adopt it for obvious reasons of convenience.

In England the style was changed by Act of Parliament of 1751, which ordered the change to take place in the following year. The difference by that time amounted to 11 days, and it was ordered that the day immediately following September 2nd, 1752, should be styled September 14th.

There was great popular prejudice against the change. It is strange, in these more enlightened days, to read of rioting English mobs, demanding that the 11 days of which they had been robbed should be returned to them. Of course in the Act of Parliament careful provision had been made against pecuniary loss by anyone through the omission of the days from the calendar.

Russia alone still adheres to the old style, the difference now amounting to 13 days.

It may now be of interest to speak of the Ecclesiastical calendar, or rather the most important point with regard to that calendar, the finding of the date of Easter and how that is done in practice.

I have already pointed out that finding the date of Easter involves the consideration of three factors, the day of the week, the day of the year, and the age of the moon. Since the ordinary year contains 52 weeks and one day, and the leap year 52 weeks and two days, no two successive years begin on the same day of the week, but in successive years the day of the week on which January the 1st falls advances by one or two according as the intervening year is an ordinary or a leap year.

If we put in the calendar the seven letters, A, B, C, D, E, F and G against the first seven days of January, and repeat them after the next seven days and so throughout the year, we shall evidently have any particular letter opposite to the same day of the week throughout the year.

The letter which designates Sunday in any particular year is called the Dominical or Sunday letter for that year. The rule for

finding the Sunday letter, which those of you who possess an English prayer book will find in the preface, is for the present century as follows:

Add to the year of our Lord the 4th part, omitting fractions, and also the number 6, divide the sum by 7. If there is no remainder the Sunday letter is A; if 1, G; if 2, F; if 3, E; and so D. C. B.

This calculation for this year would be 4)1911

477
6

7)2394

342-0

The remainder being nothing (0), the Sunday letter is A. 1st Jan., 1911, was a Sunday, and if the letters A, B, C, D, E. F. G, A, B, C, etc., are placed opposite the successive days of the year 1911, A will always be opposite to a Sunday.

I may remark that the rule fails for a leap year so far as concerns the first two months. Thus: 4)1908

477
7)2396

341-4

The remainder being 4, the Sunday letter is D. the fourth of the letters A, B, C, D. This would make Jan. 4th, 1908, Sunday, whereas Jan. 5th fell on Sunday.

In fact, in dividing 1908 by 4 we must count the terminal 8 which denotes the leap year as not quite complete in January.

Therefore, dividing 1908 by 4. we have 476, a fraction of which is to be omitted. Then: 1908

476
6

7)2390
341-3

Remainder 3 gives letter E, the 5th letter. The origin of the rule is evident. The addition of one fourth part excluding fractions, allows for the leap year intercalation.

The 6 which is added is a constant for the century, indeed for the two centuries from 1900 to 2099, since the year 2000 will be a leap year, and the regular accession of the extra day every fourth year will not be interrupted then.

For the previous one hundred years, from 1800 to 1899, the sum to be added was 0.6 1 = 7, which when divided by seven leaves remainder 0.

From 1700 to 1799 it was 0 1 = 1. Under the Julian calendar for which the rule was first constructed there would be one and the same constant for every year, irrespective of the particular century.

The Sunday letter then serves to connect the day of the week with the day of the year.

The connection between the day of the year and the age of the moon is determined by the Golden Number.

It was discovered by Meton of Athens about 433 B.C., that 19 solar years are very nearly equal to about 235 lunations. This was a notable achievement for that early age and was appreciated as such by his contemporaries. The discovery was set forth by them on tables of brass in golden letters, whence the designation Golden Number.

Using modern values of the constants involved, the length of the Metonic is found thus: The synodical revolution of the moon about the earth is completed in 29.530588 days. That is the time between successive conjunctions of the sun and moon, on the average time from new moon to next new moon, or from full moon to next full moon.

The length of the year, as already stated, is 365.242213 days.
Now $29.530588 \times 235 = 6939.68818$ days.
$365.242213 \times 19 = 6939.60204$ days.

the difference being only 0.08614 days, or about two hours. Or, if we use calendar years of 365 ordinarily, and 366 in leap years, $365 \times 19 = 6935$, to which are to be added 4 days or 5 days, according as 4 or 5 leap years occur in the cycle, thus making 6939 or 6940 days, in either case differing from the 235 lunations by a fraction of a day only.

Hence, after 19 years the same phase of the moon recurs on the same day of the year. The average divergence between the 235 lunations and the 19 astronomical years is, as shown above, only

two hours. In Julian years of an average length of 365¼ days, the agreement will be still closer.

Thus $365.25 \times 19 = 6939.75$, differing from 235 lunations by only .062 of a day, or about 1½ hours.

Therefore the 19-year cycle would be sufficiently exact, that is, with an error of less than a day, for prediction over a considerable length of time.

The ancients appear to have believed the agreement to be perfectly exact, and it was probably so considered by the framers of the Ecclesiastical calendar.

The Metonic system begins with the year when the new moon falls on January 1st. As this took place the year before the beginning of our era, or 1 B.C., the rule for finding the order of a given year in the cycle, or its golden number, is, as in the preface of the prayer book: To the year of our Lord add 1 and divide by 19; the remainder is the golden number; if there is no remainder 19 is the golden number.

Having found the Sunday letter, and the golden number, we can now find the date of Easter from a certain table of double entry.

We are therefore not much further ahead than when we began, for we might have referred first to the table in which the date of Easter is given for each year for fifty years directly.

These rules do not possess much astronomical accuracy. They may be in error as to the dates of full moons as much as two days, owing to the solar and lunar inequalities.

I may speak here of a cycle which is used in astronomy, the Julian Period. This period was devised for chronological purposes by Joseph Scaliger about the end of the 16th century. The cycle of the moon's phases is, as has been shown above, 19 years, after which they recur on the same day of the year. The cycle of the sun is $4 \times 7 = 28$ years, being the product of the number of years in the leap year circle by the number of days in the week. Thus after 28 years following the Julian calendar, the days of the week recur on the same days of the year.

Hence after $28 \times 19 = 532$ years, the phases of the moon recur on the same day of the week and on the same day of the year.

There is another cycle, called the cycle of Indiction. This is fifteen years in length, and is not astronomical, but refers to judicial acts of the Greek Emperors which took place at stated periods.

Scaliger connected this period with the lunar and the solar. Thus $19 \times 28 \times 15 = 7980$ years.

This period of 7980 years is called the Julian Period. The present year is the 6621st of the Julian Period, the year 1 A.D. being the 4714th.

This period is often used in astronomy for recording dates of phenomena, either by the Julian year with the day of the current year, numbered from 1 to 365, or 366, or by the total number of days elapsed since the beginning of the Julian Period. Simplification of computation when dates are compared is the reason for the use of this period.

Recently proposals have been made for the reform of the calendar. The object is to avoid the inconvenience arising from the month and the year not being exact multiples of the week. To find the day of the week on which a given day of a given week falls, calls for a reference to a calendar, or for a troublesome calculation if no calendar is at hand.

In a paper by Mr. Cotsworth, of York, England, which was presented to the Royal Society of Canada three years ago, the advantage of a year of 13 months, each of four weeks, were set forth. The extra day over and above the 52 weeks in an ordinary year was to be counted as a day apart, having no designation as day of the week or as a day of the month.

Christmas Day or New Year's might be taken for this extra day. In leap years the Leap Day would be treated in the same manner, inserted at any time of year which might be agreed upon. The advantage of this arrangement would be that if the 1st of January, for instance, were made to fall on Sunday, the 1st, 8th, 15th, 22nd of every month would fall on Sunday, not only during that year, but in all years.

Thus we should soon learn to connect any day of any month with its corresponding day of the week.

Mr. Cotsworth in his paper also referred to commercial advantages which would result from the equalizing the lengths of the months.

Other methods of reform have been suggested, one of which would make the quarter consist of two months of 30 days and another of 31 days. Another proposal would make three months of 30 days each with a public holiday at the end of the quarter. Of course both these would require disposal of the 365th day in some such way as Mr. Cotsworth's. They are evidently lacking

in the convenient fixed dates for the weeks which are characteristic of Mr. Cotsworth's plan. His thirteen months, however, instead of the immemorial twelve, may be an objection, in that the quarter day reckoning which is largely used in business, especially in Europe, will not fall in with the monthly division. There may be grounds also for objection for sentimental reasons.

The Federal Council of the Swiss Republic proposes to invite a general convention, comprising representatives of all nations, to meet at Berne to consider the reform of the Gregorian calendar. The proposal on which this invitation is based is, I understand, that there shall be months of 30 and 31 days in each quarter, and that the New Year's Day, Leap Day and Sundays are to bear no date. The object of this provision as to Sundays is not apparent.

(This Association is not responsible as a body for the opinions expressed in its Papers by Authors.)

CONCRETE SIDEWALKS.

BY S. B. CODE, O.L.S.

Owing to the superior qualities of cement concrete, as well as to its low cost in comparison with that of other materials formerly used, concrete sidewalks are now almost universally used in every city, town and village. All the requirements necessary in a walk are met with by this material, the chief of which are (1) an even surface, (2) solidity, (3) durability.

Specifications for sidewalk construction are not new, and it is not the intention of the writer in this short paper to give a list of specifications, but rather to deal with the question of what is the best method of carrying them into effect.

Some municipalities adopt a system of building their walks by day labor, others the system by contract. In the former case a foreman being employed, in the latter case an inspector looking after the work. The responsibility of the whole work devolves upon either of these men. When the work is done by contract and an inspector is appointed, it has been the experience of the writer that Municipal Councils are not careful enough about the selection of the inspector. Either they look to the side of cheapness and give the position to the lowest bidder, or else through sympathy or influence on the part of the members engage an incapable. The inspector should be a man of integrity, ability, and beyond suspicion, also possessing some energy, and not one who on a hot afternoon will sit down on a doorstep and go asleep while the contractor is at the same time "making hay while the sun shines."

The possibilities of cement-concrete are probably not fully appreciated, while it is also a fact that defects are to be found in concrete construction, and especially in walks, but these defects may in most cases be traced to lack of knowledge of the materials used in construction, to inexperience in such construction, and to neglect and failure on the part of the builder or inspector, to appreciate the importance of the minor details. Cracks in walks are not always caused by an improperly prepared foundation. A fractional part

of a block should not be left over even for suspension of work at the noon hour. This often occurs, and when work is resumed fresh concrete is placed against that laid in the forenoon and a top coat placed over all. The concrete in the separate parts will not properly bond, and the result is invariably a crack in the walk at this place.

To obtain best results only first-class materials should be used. The labor is the largest item and costs as much for laying the walk with poor materials as with good materials. First-class materials, skilled labor, complete specifications, a capable and efficient inspector who will see that the specifications are enforced, should give good results. Very often the inspector is too lax, and carelessness of one kind is encouraged by another. The selection of materials is the first consideration and is an important matter. Portland cement of high grade should be used, the same subjected to a close test, as it is well to take nothing for granted. As more reliance can be placed upon a reputable brand of cement than upon a natural deposit of sand, gravel or stone, it is thus important that the quality of the aggregate should receive careful attention. The surfaces presented by the particles composing the aggregate should be hard and permanent. A covering of any fine superfluous material will interfere with the cement or mortar getting into contact with the surface of the aggregate and thereby reduce the strength proportionately. The aggregates should be well graded and should not contain an excess of one size particles and a small amount of fine particles. The crushed stone should be hard and durable, clean and free from a covering of dust or other matter. In sand and gravel one is dealing with entirely different materials, and materials that should be selected with great care. Shaly particles are undesirable because they are both weak and unstable, and a concrete can never be stronger than the material making up the aggregate. The size of the sand grains and the relative proportion of grains of different size have a very marked effect upon the value of the sand. At least 75 per cent. of a sand should be retained on a 40-mesh sieve with the particles well distributed between that size and the size passing a 4-mesh sieve, with an increasing proportion on the coarser sieves. Such a sand will have much less total surface than one composed of equal proportions of particles on the several sieves. A sand made up entirely of fine particles will present a very much larger surface which must be covered with cement than either of the sands above mentioned. The total superficial surface of a given volume of spheres one-eighth of an inch in diameter is four times the surface of the same volume of spheres one-half an inch in diameter. To obtain first-class concrete it is necessary to perfectly cover every particle of sand with cement, and every particle of the coarser aggregate with the cement sand mortar. It is therefore

essential that materials with an excess of fine particles should not be used. Compressive strength is in favor of the coarser material. To give the maximum strength and use at the same time the least cement, the aggregates should be so graded as to have each successive size material fill the interstices left by the preceding larger size. It has been found by experiment that aggregates exceeding one and one-fourth inches in diameter should not be used. The lower limit, one-quarter of an inch, which is also the upper limit for sand and stone screenings, is almost universally accepted.

The foundation should provide a permanent bed for the walk, and serve as a means for disposing of water which would otherwise accumulate under the walk. It is very important that the foundation should be so constructed that neither time nor the elements can change its ability to support the walk. It is usually necessary to prepare the sub-grade, upon which the foundation is established. If the soil at the excavated grade is firm and solid there is no necessity for further preparation, but if it contains any soft, boggy or spongy places, these should be removed and the holes filled with firm material and thoroughly consolidated by ramming or rolling as the filling progresses. The preparation of a fill for the sub-grade requires care. The upper portion of the fill should be tamped in layers not to exceed six inches in thickness. The sides of the fill should be given a slope of not less than 1½ to 1, so that it will not slip away, and when granular materials are used the sides should be banked on the slope with sod or clay.

Any piece of work is large enough to justify a study of the aggregates for the purpose of determining the correct proportions. It has been stated that the ordinary mixture for water-tight concrete is about 1 part cement, 2½ parts sand and 4½ parts coarser aggregate, which requires 1.37 barrels cement per cubic yard of concrete. The most practical way of arriving at the proper proportions is by the determination of voids, or space that is occupied by air. In order to eliminate the error which might arise from absorption of water in the process of determination of voids, the material, if dry or porous, should be wetted slightly and afterwards dried so as to remove this moisture from the surface. In the actual process of determining the voids, a cylindrical vessel of metal of 1 cubic foot capacity may be used. The vessel is first weighed and then filled level full of water and weighed again. Call the net weight of the water C. Empty and dry the vessel and fill level full with the aggregate. Call the net weight of the aggregate B. Pour water slowly into the aggregate until the vessel is again

level full of water. Call the net weight of the aggregate and water A. The formula then is per cent. voids equals $\frac{A-B}{C}$ 100. To determine voids in sand and stone screenings, the sand should be poured into a vessel containing water. The object in doing this is to eliminate the air, which is impossible if the order is reversed. When the vessel is level full of sand and water, the weight is determined and the formula given for the coarser aggregate applied.

Proper mixing of the materials composing the concrete is very important. Machine mixing has its advantages and its disadvantages. The sand and cement should be first mixed dry and then mixed wet into a homogeneous mortar. The coarse aggregate previously mixed should be added to this mortar, and all thoroughly mixed together. Hand mixing, if carefully done, is entirely satisfactory. Oftentimes mixing is sadly neglected, or is entrusted to unskilled laborers who have little or no appreciation of what is really necessary and less interests in final results. Machine mixing with the batch type of mixer is reliable.

About every fifty feet a good expansion joint should be made. This may be accomplished by replacing one of the wooden cross forms by a metal parting strip, which should be left in the walk until it is open to traffic, when it will be removed and the opening thus produced filled with pitch or other suitable material.

Care should be exercised in adding water to a concrete mixture, because, as is often the case, the water is thrown on a bucketfull at a time, and the cement is thereby washed from the mixture. The water should never be added faster than it can be taken up by the materials. When additional water is required in a mixture it is a good practice to add it in a spray.

Concrete or mortar which shows perceptible hardening or drying out should not be re-mixed nor used. Any disturbance of concrete after hardening has begun will weaken it.

Where hand-mixing is made use of the concrete is usually mixed on a water-tight platform, and the size of the batch may be governed by the speed of mixing and depositing in place. Before placing the sub-base should be previously wet and tamped and the concrete deposited immediately after being made, having regard for the preservation of the proper proportions. As the concrete is usually deposited with wheelbarrows, there is a tendency for the cement, being fine, to be carried in suspension with the surplus water away from the other materials. On hot drying days the loss

of water by evaporation from the mixture should be prevented, as it forms an essential constituent part of the concrete.

The top finish, when put on separate from the concrete, should be a mixture of one part of cement to one and a half parts of screenings or coarse, clean sand. This should be put on immediately after the concrete has been consolidated. Any time which elapses between the laying of the concrete course and the laying of the finishing course, will seriously interfere with the bonding of the two. The longer the interval the more drying out will take place in the concrete, and there is no assurance that a perfect bond can be attained, except by special treatment, such as cleaning off any dust, sand or foreign matter and applying a wash of neat cement and water.

A very important point in sidewalk construction, and one which is very much neglected, is the making of proper expansion joints. Usually the place for the joint is marked on the edge of each form and an attempt is made at making a sort of indifferent joint by forcing a thin piece of iron or a trowel through the base. This is filled with dry sand. Afterwards the top finish is floated and trowelled and before setting the same tool is driven through the finish in an endeavor to strike the opening in the base. Often, through carelessness, this top mark is not made directly over the bottom mark, but the two marks are some distance apart and the result is invariably a break in the top above the joint in the base. A good joint can easily be made, as stated in the foregoing part of this paper.

After the walk has been completed care should be exercised to protect it from the action of the elements. A covering of canvas or other material is usually used, as too rapid drying in a hot sun is apt to result in checking. After the cement has thoroughly set it is a good idea to keep the walk moist for a time.

Discussion.

The President—The first paper on the programme for this morning is one by Mr. S. B. Code on "Concrete Sidewalks."

Mr. Code then read his paper which was received with applause.

The President—Does anyone wish to make any remarks on Mr. Code's paper or ask him any questions.

Mr. McDowall—Did you have any trouble, in your experience, in the way of expansion of the joints in the sidewalk and having them lap over?

Mr. Code—Yes.

Mr. McDowall—Afterwards expanding and lapping over?

Mr. Code—Yes.

Mr. McDowall—I have had some such results in a sidewalk 600 feet long. It wasn't looked after properly and two years after it lapped.

Mr. Code—Yes. The point I mentioned was that the joint on top didn't come directly over the joint in the concrete, and that caused a crack, while in other cases where there was not a proper joint either the two blocks heaved up or the top separated from the concrete altogether.

Mr. Gibson—Did you sometimes find that the hot weather in the summer was as bad as the frost in the winter?

Mr. Code—I guess it is.

Mr. Shaw—How long would you advise the bottom course to be on before the top is prepared?

Mr. Code—It is better to put them on together if possible.

Mr. Gibson—That is, the finishing to follow right off.

Mr. Code—Yes. It is very difficult to arrange it sometimes because it comes on to rain for a couple of days.

Mr. Gibson—How do you generally test your sidewalks for hollows when you are going over them?

Mr. Code—You can tell by walking on it pretty well.

Mr. Gibson—I generally take a tamper and tap on it; you can very soon tell whether there is a hollow or not.

Mr. Bray—A baseball bat is a very good instrument, too.

Mr. Gibson—Surveyors will find that for municipal engineering as well as surveying, to be a success, you must almost be a lawyer to be able to advise the Council on all things. There is a lot of work in it; it is very advantageous having practice in that way.

I have much pleasure in moving that the paper be received and published in the proceedings.

On the motion being seconded by Mr. Bray it was adopted.

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SOME EARLY LANDMARKS OF UPPER CANADA.

BY A. R. DAVIS.

Prior to the Revolutionary War two surveyors became somewhat prominent, not only in their profession, but in the maintenance of British supremacy on the North American Continent and in the termination of the power of France. George Washington, originally a practising surveyor in Virginia, drifted into a military life, and struck the first effective blow at French dominance in America in 1754, when only twenty-one years of age.

Samuel Holland was present with General Wolfe at Louisburg and on the Plains of Abraham, and received a gift of a brace of pistols from that renowned hero, who wrested Canada from France and handed it over to England. Holland afterwards became Surveyor-General of the British Colonies North of Virginia, and made extensive surveys in the vicinity of Boston. In 1775 he wrote Lord Dartmouth he was ready to run the line between the State of Massachusetts and New York. But grave trouble had arisen between the Motherland and her American colonies, and Holland, confronted with serious difficulties, changed his place of abode to the City of Quebec, and thereafter devoted all his energies, as Surveyor-General, to the subdivision and settlement of Upper Canada.

Holland throws an interesting sidelight on his experiences at that period in a subsequent report to the Government on the surveying instruments in his possession. He proudly made mention of his complete set of private instruments, in which he had great confidence from long and excellent service; "although at one time," said he, "they were much deranged by being removed from their boxes by Mrs. Holland, to prevent their being carried off by the Americans, while she and her family were their prisoners in the year 1776." Here we find in his own words the reason for the sudden change in the field of Holland's surveying operations. True to his oath as a surveyor and to his vow of allegiance, he and his family suffered at the beginning of the seven years' war what many faithful British subjects endured through the years that followed. We can very properly say Holland was one of the original United Empire Loyalists.

Had George Washington's merits as a leader been wisely recognized by the British authorities in those early days of his career, doubtless he too would have remained true to his vow; and thus the Revolutionary War might have been averted, for without Washington as leader the rebellious forces could scarcely have won at that time. Had there been delay in the rebellion until England could get rid of the Government led by the ignorant and stubborn Lord North, the American Colonies would probably have been appeased by fair and just legislation in the Motherland. Had that terrible war been averted, subsequent wars on this continent would probably have been averted also, and who can say what a mighty people we might have become. Our population on this North American Continent, all under the British flag, might be twice or three times what it is to-day. Instead of discussing the A. B. C's of trade relations as we are to-day, in the question of reciprocity, we might, had these two great surveyors. Washington and Holland, pulled together in the early days in the subdividing and settlement of the country and the expansion of trade and commerce, have become a wonderfully progressive nation. Our people might universally be now enjoying that exalted and happy condition of life of which we sometimes dream as a possibility in the far and distant future, where poverty and drunkenness and crime will be unknown, and where every man will become his brother's keeper.

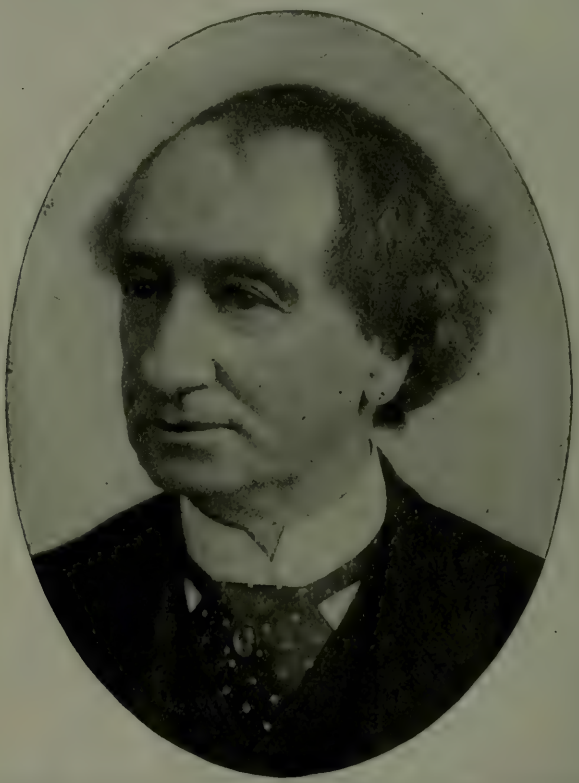
But, however green the far-away hills of speculation may appear, we must inevitably come back to the stern realities of history, in our endeavor to trace some of the imprints the pioneer surveyor Samuel Holland, and his successors, left upon this great western country, especially that part first surveyed, bordering on the St. Lawrence River and the Bay of Quinte. Every member of this Association, who has not already done so, should avail himself of the first opportunity to visit that district in the summer season, and, if possible, spend a day at old, historic Adolphustown, a small township nestling in the big bend of the Bay of Quinte, about midway of its length.

Many who have circled the world, observing the beauties of nature everywhere, return home to declare that here, in Central Ontario, we have delightful places, "unrivalled in beauty and splendor that cannot be told."

Entering the Bay of Quinte from Lake Ontario, through the Murray Canal, we are at once impressed with the great diversity of scenery spread out before us. All that is lacking to complete the picture are some towering cliffs with cascades, surmounted by a mountain peak in the background crowned with perpetual snow. But of course such rugged scenery, involving a general volcanic

eruption, would render the sylvan and pastoral beauty and agricultural development and perfection spread out before us on the plains or uplands on either side.

As we slowly steam eastward down the Bay some thirty miles, then abruptly swing to the south-west for ten miles, and again turn to the east and continue our course for another forty miles to the lower extremity at Kingston, the beautiful scene is continually



SIR JOHN A. MACDONALD, WHOSE BOYHOOD HOME WAS IN ADOLPHUSTOWN.

changing. We discover well-cultivated farms separated by parallel fences, usually about two hundred yards apart; a variety of shade trees in which the elm, maple and beech predominate, interspersed over the meadows and plowed fields; a denser growth with variegated foliage covering the more remote uplands; rivers of considerable size and great length pouring their waters into the quiet

bay, to be discharged into the mighty St. Lawrence; creeks, inlets, marshes and small wooded islands; prosperous cities, bustling towns and sleeping hamlets, here and there, breaking the monotony of comfortable farm dwellings and outbuildings in evidence on every side; countless herds and flocks roaming over luscious meadows, or resting under the shade of a great variety of trees; plow teams and heavily laden wagons slowly moving along the fields, lanes and highways; covered carriages, buggies and automobiles gliding leisurely along the smooth macadamized roads skirting either shore; an endless procession of large and small steamers, launches, sailboats, schooners, skiffs and canoes.

These are a few of the sights we behold as we sit out in the balmy air, screened from the sun's rays and view the landscape o'er, while our boat glides slowly through the crystal waters.

A variety of sounds meanwhile greets our ears. We hear the shout of the farmer at his cattle, or sleek, lazy horses; the singing of his wife or daughters in the midst of their household duties; the whinny of horses and foals; mooing of cattle; bleating of sheep; squealing of pigs; crowing, cackling, gabbling and quacking from the farm yards; blowing of whistles; tooting of horns at the noon hour; laughter of merry children at play; distant strains from a farm-house piano, and, last but not least, the delightful song of a variety of birds.

As we comfortably sit hour after hour, chatting with a friend or musing over a book or magazine, while drinking in the pleasing sights and sounds that greet our eyes and ears, our thoughts meanwhile travel back to earlier days, when scenes were very different along this popular water-route. Here was enacted many a drama and tragedy in those early years when Canada was young and the red man's authority was undisputed.

Champlain lighted his camp fires here on more than one occasion in the early part of the 17th century, when voyaging with his Indian guides and warriors from the home of the Hurons and Algonquins in the north to the land of the great Iroquois confederation in the south. He wintered on a tributary of these waters; and we can scarcely appreciate the hardships of such an experience in this cold country without supplies or adequate protection from the cold.

Here, too, La Salle camped many a time as he started from Fort Frontenac on his several long expeditions into the unknown west, as far as the Mississippi; or on his return, when wearied and almost exhausted, he would here spend his last night in camp in

some secluded inlet before dragging himself back into the rude fort from which he started several months before. Other French explorers and missionaries of those early days found these quiet inland waters, where wood and fish and game were plentiful, a pleasant retreat. Doubtless they spent many nights in camp along the low, secluded shore of its many inlets, where wind and storm could not disturb.

The dusky natives continually plied their fur or provision-laden birch bark canoes to and fro over these waters for centuries. Here they held feast and high carnival around the glowing camp-fires; here they mustered for battle against their savage enemies, and here they laid away their dead to rest under the sombre shade of the giants of the dense forest, with sufficient food on their biers to carry the departed over to the Happy Hunting Grounds.

Decade followed decade; one century gave place to another, and still there was but little change in this great expanse of inland country tributary to the Bay of Quinte and subject to the throne of France. Wolfe, the renowned hero, in due time came upon the scene, as already said, and speedily wrought a wonderful transformation. Thereafter the song of the French voyageur and the plaintive call or war-whoop of the Indians, were less frequently heard in Western Canada. Anglo-Saxon voices now startled the animals and birds of the Bay of Quinte with new and strange sounds. France's long dream was forever ended.

Fort Frontenac's days of usefulness as a trading post or western bulwark of defence slowly faded away under the changed conditions, and quietude prevailed on these inland waters.

Then came the prolonged Revolutionary War, with its terrible loss of life and property and the splitting into two fragments of what otherwise might have been a united Anglo-Saxon people, governing all the vast domain of North America.

But the terrible disruption south of the St. Lawrence and the Great Lakes signalled the dawn of a new era on the Bay of Quinte. When all other places had been filled to repletion with the loyal and faithful though defeated and impoverished supporters of King George III., there were still several hundred of the bravest of the brave hovering about New York, pleading with the British authorities for some spot, under the Union Jack, where they might be permitted to emigrate and start life anew. The rugged wilds of Western Canada were suggested as a haven of rest for these tired souls, who, in the fierce struggle of several years' duration, had lost

all their property and were now outcasts and paupers, dependent upon the crumbs that fell from the tables of their tyrannical masters.

Soon seven vessels were loaded with men, women and children in New York Harbor, and guarded by a warship, "The Hope," set sail on a memorable day in September, 1783, for their new home in the Canadian wilderness. Without serious mishap they crossed the broad waters, coasted round Nova Scotia and Cape Breton, passed through the Gulf of St. Lawrence, and ascended the

MONUMENT IN ADOLPHUSTOWN ON SITE OF U.E.L. LANDING PLACE IN 1784.

river to Quebec. They proceeded to Sorel, where they disembarked with their tents, provisions and few earthly effects, and went into winter quarters, while the vessels returned to New York. Owing to the inclemency of the weather the frail, thin army tents, a lack of provisions and clothing, and the terrible scourge of smallpox that infested their dismal camp, these United Empire Loyalist emigrants, notwithstanding their brave hearts and grim determination, were in a sorry plight by the time the spring sunshine had cleared the river of ice and rendered its ascent possible.

A sufficient number of long, narrow bateaux were provided by the British Government to carry them up the river. Into these they were bundled with their baggage, four families to a bateaux, and up the river they slowly proceeded, battling bravely with the stiff currents. They mounted the rapids one by one, the men pulling by ropes attached to the bows of the bateaux, while the women sitting therein, and caring for the children, cheered the toilers with snatches of familiar songs. Where the rapids were strong and hard to navigate small bands or brigades would club together, and after pulling and lugging one boat to the head of the rapids, all the men would descend and haul up another, and then another, until every bateaux was safely afloat again on a higher reach of the river.

Thus difficulties and hardships were but stepping-stones to something higher and better to this intrepid band of Canadian Pilgrim Fathers in their search for a new home. At last the several rapids were surmounted by the many small brigades. Then forming themselves into their original companies under their respective leaders, they more leisurely threaded their way through the placid waters of the Thousand Islands. Here the wonderful beauties of nature doubtless encouraged pleasant conversation and cheerful song as they slowly wended their way towards the setting sun. As the latter dipped below the horizon, sending forth golden gleams to embroider the soft, fleecy spring clouds that dotted the western sky, this brave band of United Empire Loyalists rounded the point leading into the Bay of Quinte. With rapture and delight they beheld their beloved old Union Jack proudly waving over the battlements of Fort Frontenac. Can we doubt that they made the welkin ring with cheer after cheer as they vigorously pulled for the shore, animated with the thought that their long, weary pilgrimage was at an end.

They were warmly welcomed by a small band of British subjects at the Fort. Soon the tents were erected, the camp fires lighted and the evening meal enjoyed as never before. Then night threw her sable mantle over a group of as brave men and women as ever assembled in one camp, and they enjoyed a well-earned rest. They soundly slept and dreamt of a better day, and the birth of a new nation, of which they were the pioneers.

But early though they were upon the ground, the surveyors had been there before them. Samuel Holland, his chief deputy, John Collins, had been on the scene with their chains and instruments marking out the homesteads.

The writer has been permitted to look through the old correspondence of that period, on file in the Crown Lands Department,

Toronto, between the various surveyors, the Governors-General and officials of the Government at Quebec, and later at Newark and Toronto.

Now, if you look back into the records of this Association to the year 1886 you will find a most interesting and instructive article by the President of that year, Mr. Kirkpatrick, whom we are all glad to see, after the lapse of a quarter of a century, still in the harness as Director of Surveys of the Province, and an active officer of this Association.

Several of the old letters are published in that article, which gives a general review of the surveying profession up to that period, and is well worth reading again by those who can place their hands on an early copy of the Proceedings of this Association.

These old documents are intensely interesting to a surveyor, who is carried back in spirit immediately to the days when the laborious work of surveys and settlement were in progress over a century ago. In imagination he experiences all the difficulties his illustrious predecessors went through and heaves a pitying sigh when he discovers the mere pittance of a salary the poor surveyor received for his arduous and faithful services. One is well repaid for a few hours spent among the letters of the surveyors of those bygone days. In no other way can one so accurately glean certain historical facts concerning surveys and settlement and the confidential relationship that apparently existed between the representative of the King and his trusted surveyors on the frontier of civilization.

From one Bongard, in the Bay of Quinte district, whose father was Samuel Holland's personal attendant, it has been learned that the Surveyor-General pitched his tents in the year 1783 at the first big bend of the bay, some forty miles above Kingston, which afterwards became the Fourth Township, or Adolphustown. From this central point as headquarters Holland directed the various surveys in progress on the bay through his chief deputy and his several assistants. Great activity prevailed, in anticipation of the advent of the great throng of U. E. Loyalists, both here and on the north bank of the St. Lawrence River, from New Longueil to Elizabethtown, where the surveys of nine townships were in progress at the same time.

It is probable Holland returned to Quebec in the winter of 1783-84, leaving his deputy, Collins, in charge of the surveys, with headquarters at Cataraqui.

The following spring saw one of the most active movements up the St. Lawrence and Bay of Quinte ever known in the settlement

of the continent of North America. Each settler was entitled to his Government grant of two hundred acres, and John Collins had the double task to perform of first getting the lots in the various townships surveyed, or at least outlined, and then to assist each settler to choose his lot, by lot, and locate thereon. The custom was, it is said, for the surveyor to fill his hat with strips of paper numbered with the lots of the township in question, and allow each settler to draw a number by chance, with which choice he was compelled to abide.

When we remember that the surveys had only nicely begun when these poor, unfortunate U. E. Loyalist settlers began swarming in by thousands, each one pleading with the surveyor for his homestead, we can appreciate in some degree the strain upon Col-

FIRST METHODIST CHURCH IN CANADA STILL STANDING IN ADOLPHUSTOWN, BUILT IN 1791.

lins, the field man, who stood as a buffer between thousands of anxious settlers on the one hand, and the Government at Quebec and in the Motherland on the other. Here is the copy of a letter from John Collins to Governor Haldimand, Quebec, dated Cataraqui, Aug. 12th, 1784, which gives us the actual condition of the surveys at that time, and also some of the difficulties under which he labored.

"I had the honor to receive Your Excellency's letter of the 20th of July, enclosing a Didimus Potestatim authorizing me to administer the several oaths therein mentioned to Major Ross and

Mr. Neil McLean, which I have accordingly done and enclose the same herewith, together with the Didimus Potestatim. I have likewise the honor to report to Your Excellency that I have completed the survey and settlement of the Fifth Township, situated on the peninsula between Lake Ontario and the Bay of Quinte (now known as Marysburgh), the whole of the disbanded British troops and Germans have drawn their lots, each man has taken the oath agreeable to the King's instructions, signed the books, received his certificate, and is now in possession of his land, with which I am persuaded they will be well pleased, as the lands in general appear to be of good quality. I am sorry to acquaint your Excellency that the business with respect to completing the surveys and settlement of the townships laid out last autumn is not so forward as could be wished or from the length of time Your Excellency had reason to expect. The poor people have set themselves down half a dozen together in different parts of the townships, not knowing where to find their lots except those in the front, nor can it be expected until the several lines between the different concessions be drawn and boundaries fixed, which has not yet been done. I should have set out on that business this day, but find myself too weak, having just got quit of a fever which I have had for some days past. However, I have employed Mr. Tuffe and Mr. Henry Holland, with each a good party, in drawing the lines of the second and third concessions of the first township. On their return I shall proceed up the lake and complete the surveys of the second and third townships in like manner. With respect to the fourth township nothing can be done until Your Excellency determines to whom it belongs. No doubt the parties who are obliged to quit their claims will expect their land in some other place. I shall therefore without loss of time when the business above mentioned is completed, go in search of another township, and by the first conveyance send Your Excellency a plan of the settlement lately made, with an account of my success.

"I find great difficulty to get men and am obliged to pay high. I have taken the liberty to draw on Captain Maurer for £100 currency to carry on this service, which I hope Your Excellency will approve of. Your Excellency may faithfully rely on my bringing this troublesome business to as speedy a conclusion as possible.

"I have the honor to be Your Excellency's most obedient and most humble servant,

"(Sgd.) JOHN COLLINS."

Now, it will be observed that even at that early date a dispute had arisen over the fourth township, which Collins informed the Governor he would not survey until he found out to whom it be-

longed. The trouble was this: Captain Grass and his company had been assigned first township, or Kingston. General Rogers and General Johnson, with their companies, were assigned township two (Ernesttown) and township three (Fredericksburg), while Major Van Alstine and his company were assigned the fourth township (Adolphustown). Now, when it was found that townships two and three were not large enough to accommodate all of those assigned thereto, claim was made on the fourth township as well; but Major Van Alstine's company, though small, could not be dispossessed. It is said the Surveyor-General and his deputy, Collins, took opposite views of the matter, which finally had to be referred to Quebec. The outcome was that fourth township was split in two from north to south, and the east strip 12 lots wide was attached to third township and became known as Fredericksburgh Additional.

The several arms of the bay cutting into and through the balance of fourth township enabled Major Van Alstine's little company to settle upon and begin the clearing at once of the whole township. As they were among the most enterprising and intelligent company of men in the whole U. E. Loyalist movement into Canada, we can readily understand how this small township quickly took a leading place in all the affairs of Church and State in this Western Province.

Here is Deputy Surveyor Aitkin's description of the Township of Adolphustown, in keeping with the descriptions of all the adjoining townships found in the Crown Lands Records:

"Beginning at a stone boundary on the north bank of the Bay of Quinte, on the westernmost boundary of the Township of Fredericksburg; thence in a southwesterly direction along the northernmost bank of the Bay of Quinte to the westernmost extremity of a point to the southward and east of a small island in Perch Cove; thence along the banks of Perch Cove and Bass Cove to the westernmost boundary line of the Township of Fredericksburg; thence along the said boundary of line south thirty-one degrees east to the place of beginning, as is more fully described by the plan hereto annexed."

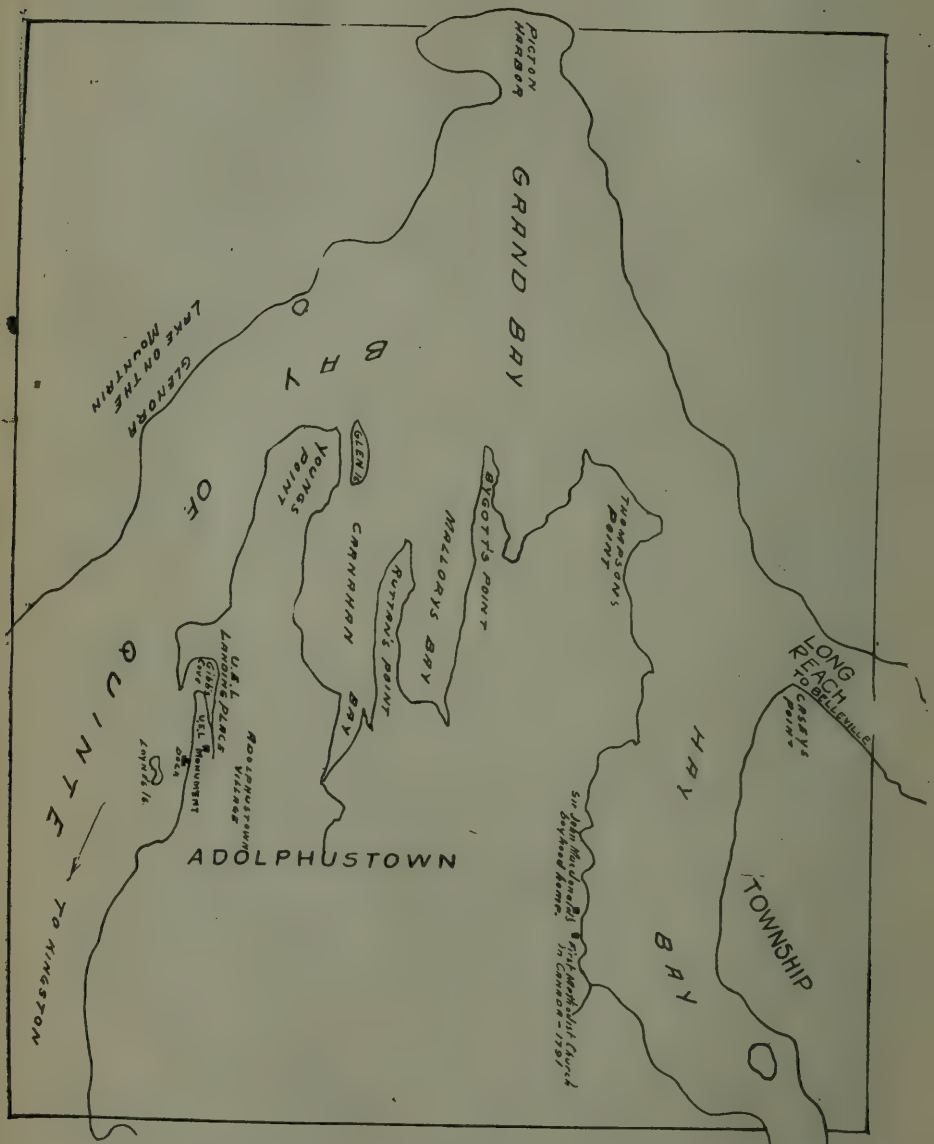
I fear so indefinite a description would scarcely pass muster with our Director of Surveys to-day. Another of the early surveyors was Philip R. Frey, who was nominated and appointed a Deputy by the Surveyor-General on Dec. 22nd, 1784, and appointed to conduct surveys at Detroit and Niagara on the 19th Jan., 1785. The other Deputies of those early days were: William Chewett, at Lake St. Francis; Patrick McNiff, at the Ottawa or Grand River;

James and Hugh McDonell, at the vacant lands, between Elizabethtown and Pittsburg; and Alexander Aitkin, at Kingston or Toronto.

Thus, beginning his surveys at the eastern limits of Upper Canada, and providing settlement for the large contingent of U. E. Loyalists who came in from the Atlantic, the Surveyor-General and his active assistant soon extended their field of operations to the Niagara frontier and the west to meet the demands of the great inflow of settlers now crossing the boundary at all points from the south land. Here similar experiences were met with by the surveyors, and as practically the whole country was bush, the progress was slow. However, as we look back upon that period, with a knowledge of how slowly settlement and development move along in our western bush-country to-day, we are amazed at the brief period that elapsed between the U. E. Loyalist movement into this Province and that time when peace and plenty, or at least a competency, may be said to have prevailed in every settlement. Our forefathers truly must have been made of good stuff, and nobly they fulfilled their part, with an indomitable courage, a fairness between man and man and a sublime faith in God it would be difficult to find among their descendants. The various elements were about as diverse as we find in a Northwest settlement to-day, and yet harmony for the most part prevailed.

Our friends and allies, the Mohawks, under their great Chief, Brant, came to the parting of the ways at what is known as Indian Point, where the Bay of Quinte first joins Lake Ontario. Here Captain John, a cousin of Brant's, withdrew with his party from the great Chief and his followers, in their ascent of the St. Lawrence from Lachine, whither they had fled from the Mohawk Valley, New York, in the early days of the Rebellion.

The Mohawks had successfully negotiated the St. Lawrence Rapids in their canoes in the spring of 1784. Then paddling westward from Cataraqui along the quiet interior waters, the great flotilla of canoes was seen to divide. The larger part threaded its way along the north shore of Lake Ontario, under command of the venerable Chief, Brant, reaching Niagara in due time; and, later, the Reserve at Brantford. The smaller company, under Captain John, turned the bows of their canoes but a trifle to the north, keeping in the safer inland waters. They passed round the Adolphustown bend of the Bay of Quinte and possibly broke bread with Captain Van Alstine and his intrepid and busy little company just beginning their life in the wilderness. They found their homesteads at the next big bend in the Bay in the well-known Township of Tyendinaga, just west of Deseronto. Captain John's Island,



MAP OF BAY OF QUINTE AT ADOLPHUSTOWN.

immediately in front of the Reservation, has been a well-known landmark of the Bay of Quinte to this day. Under date of Quebec, Dec. 19th, 1787, John Collins wrote Lord Dorchester, the Governor, that he had laid out a block of land twelve miles wide, fronting on the Bay of Quinte, by fifteen miles deep, for the Mohawk Indians, to which survey Captain John, Chief of the village, objected. However, in good time we learn Captain John and his people were conciliated. To-day their descendants are a prosperous and happy people, still living on the fertile homesteads of their loyal ancestors.

One freak of nature which has always attracted more attention, perhaps, than any other landmark in the Bay of Quinte district, is the now familiar Lake on the Mountain. Here on the Prince Edward shore at Glenora, just opposite Adolphustown, on the top of a bold escarpment, is a somewhat large and extremely picturesque lake 160 feet above the level of the Bay of Quinte. Major Van Alstine quickly observed the utility of this lake and obtained a grant of over 400 acres, surrounding it, from the Government. He erected a grist mill on the shore of the lower bay and led sufficient water down from above by a small, shallow ditch to do the grinding for the whole community. The process is still going on to-day under improved engineering conditions permitting of quite a diversity of cheap manufacturing at this important spot.

The surveyors of the early days did not have all the difficult experiences. Here is one of some ministers who accompanied Bishop Asbury into the country for the first time, as recorded by one of the company:

"We had a severe time on our journey. We crossed Lake Champlain and Mr. Asbury preached in a bar-room in Plattsburgh. On entering the village of St. Regis, as Mr. Asbury was leading his horse across a bridge made of poles, the animal got his foot between them and sunk into the mud and water. Away went the saddle bags, the books and clothes were wet, and the horse was fast. We got a pole under him to pry him out; at the same time the horse made a leap and came out safe and sound. We crossed the St. Lawrence in romantic style. We hired four Indians to paddle us over. They lashed three canoes together and put our horses in them, their forefeet in one canoe, their hind feet in another. It was a singular load; three canoes, three passengers—the Bishop, Smith and myself (Boehm), three horses and four Indians. They were to take us over for three dollars. It was nearly three miles across to where we landed. Did not reach the other side till late in the evening. The Indians claimed another dollar, because three could not easily be divided between four. This was cheerfully paid. We arrived in Canada on July 1st, 1811, landing at Cornwall.

and about midnight reached the hospitable house of Evan Roise, who hailed the Bishop's arrival with joy and gave him and his companions a welcome worthy of patriarchal times."

The writer thought it well to mention this tale in passing, as some of our surveyors may possibly require similar transportation in the north and west country. The chief danger in adopting this plan, however, might be that they would not find the bronchos up there under as good subjection as were those of the good Bishop's party a century ago.

The first town of a new District or Province is always an interesting landmark in the years to come. Kingston had its early struggles and adversities in evolving itself from the decayed ruins of old Fort Frontenac, and the scattered log shacks of the Cataraqui village. Several distinguished officers endeavored to make the place an important military and naval depot, and considerable Government money was spent there from time to time in the erection of fortifications, public buildings, harbor improvements, etc.; but while nature had done its part in making it a strong base, the necessities of the country did not seem to demand the military and naval equipment on these inland waters that a seaport town would probably have been compelled to inaugurate.

Two distinguished Governors of Canada endeavored to make Kingston a Capital City and failed in their attempts. The first was Lord Dorchester, whose preference and desire was that Governor Simcoe, in the year 1791, should establish his seat of government there, at the foot of Lake Ontario; but, as is well known, the new Governor, with a mild dose of the western fever, selected Newark, at the head of the lake, for his Capital, which eventually gave place to York, or Toronto.

Doubtless this proved to be in the best interests of the whole Province, since our present Provincial Capital occupies a splendid central and commanding location for the seat of government. No one would change it to-day.

Again, at the union of the Upper and Lower Provinces in 1840, Lord Sydenham chose Kingston for the Capital of a United Canada and established his seat of government there. But again the fates were against the pioneer city, for after the premature death of the Governor-General in 1842 by an accident, forces began to operate which led to the removal of the seat of government to Montreal in 1845. Then, after perambulating about the country for two decades, it became finally established at Ottawa, at the time of Confederation.

As Canadians we are all satisfied to-day with the location, development and beauty of our Federal Capital, Ottawa; but it is very interesting to note the various evolutions in the past which wrested from Kingston its fair prospects of being the Capital and stripped it of its former military glory. The Tete Du Pont Barracks of Kingston still stand to perpetuate the site of old Fort Frontenac; and the grim fortifications crowning the hill-top of the outer point, abandoned and useless, remind the passing excursionist to-day that this was an important military and naval stronghold in the earlier days of Upper Canada.

There are many other interesting landmarks to which we would like to refer, but space forbids. Our rambling glimpses of the past may serve to arouse some other member of this Association from some other part of the Province, especially the western, to follow up the subject with descriptions and experiences of early explorers, surveyors and settlers in those regions which were a terra-incognita to our forefathers a little more than a century ago.

One word in conclusion with respect to the end of the career of the pioneer surveyor of Upper Canada, Major Samuel Holland, as given by Dr. Canniff, in "The Settlement of Upper Canada," page 155:

"Extending from the brow of St. Foy Heights along St. Louis Road at Quebec was a piece of land of 200 acres which was known as the Holland Farm. This farm had belonged to a rich merchant of Quebec, Mon. Jean Tache, who wrote the first Canadian poem, 'Tableau de la Mer.' He was the ancestor of the late Sir E. Tache. About the year 1740 he built upon an eminence a high-peaked structure which, during the siege of Quebec, was the headquarters of General Montgomery. This place was bought by General Holland in 1780, who lived there in affluence for many years subsequent to the close of the war in 1783. The elite of Quebec were wont to resort here to enjoy his hospitality, and in 1791 he entertained Edward, afterward Duke of Kent, the father of our Queen. This place is now known as Spencer Grange, but the old building has long since been removed, to be replaced by the present well-known mansion. From the St. Foy Road may be seen a fir tree known as the Holland Tree. Under that tree are several graves which some years ago were inclosed with a substantial stone wall with an iron gate. But now only the foundation remains. Two of the graves had neat marble slabs with the names of Samuel Holland, Senior, and Samuel Holland, Junior. 'Here rest Major Surveyor Holland, and his son, who was killed in a duel at Montreal by Major Ward of the 60th Regiment, by a shot from one of a brace of pistols presented to Major Holland by General Wolfe.'"

Should any of us chance to visit Quebec, it will be interesting to find the spot described above, and read the inscription on Major Samuel Holland's tomb, knowing as we do perhaps a little more fully something of the important part he played in planting the original landmarks of Upper Canada as our first Surveyor-General.

PRELIMINARY EXAMINATION, FEB'Y, 1911

ARITHMETIC.

1. Reduce to an improper fraction $576\frac{576}{577}$.

2. Reduce to a simple fraction $\frac{17}{100}$ of $\frac{11}{200}$ of $\frac{9}{1000}$.

3. Simplify $4\frac{4}{7} - \text{of } 3\frac{1}{16} - 2\frac{2}{3} - \text{of } 1\frac{5}{16} + \frac{8}{9} - \frac{3}{14} - \text{of } \frac{7}{4} - \text{of } 4\frac{4}{7}$

4. Find the square roots of the following numbers:—15129, 54756, 92416, 370681.

5. Find the cube roots of the following numbers:—1367631, 12812904, 107171875.

6. Four men working eight hours a day take 22 days to pave a road a quarter of a mile long and 35 ft. broad; how many days will four men, two of whom work eight hours and two ten hours a day, take to pave a road 1,575 yards long and 36½ ft. broad?

7. A can do a piece of work in 7 days, B in 10 days and C in 14 days. How long will it take C to finish the work if A and B have both worked at it for 2 days?

8. A father willed his property amounting to $26,600 to his two sons, aged 14 and 17 years, respectively, in such a way that the sums loaned at 6% per annum, simple interest, would be equal when they became of age. How did he divide it?

9. Find how long it will take a train 87 yards long and running at the rate of 40 miles an hour, to pass another one 100 yards long and going in the same direction at the rate of 30 miles an hour.

10. If 2 pounds of tea are worth 3 pounds of coffee, and 14 pounds of coffee worth 8 pounds of cocoa, and 2 pounds of cocoa worth 24 pounds of sugar, and 16 pounds of sugar worth 11 pounds of raisins, how many pounds of raisins would be worth 7 pounds of tea?

ALGEBRA AND LOGARITHMS.

1. Find the value of $5(a-3b)(a-b) - b\{3a - c(4a-b) - b^2(a+c)$ when $a=0$, $b=1$, $c=\frac{1}{2}$.

2. Prove that

$a^m \times a^n = a^{m+n}$, $(a^m)^n = a^{mn}$, $\frac{a}{0}$ = infinity, $\frac{0}{0} = 1$ or indeterminate, $X^n - Y^n$ is divisible by $X-Y$ if $X-Y=0$.

3. Simplify

$$\frac{10X-11}{3(X^2-1)} - \frac{10X-1}{3(X^2+X+1)} + \frac{X^2-2X+5}{(X^3-1)(X+1)}$$

4. Find the greatest common measure of

$7X^3 - 10X^2 - 7X + 10$ and $2X^3 - X^2 - 2X + 1$

L. C. M. of $(a^2b - 2ab^2)^2$;
$2a^2 - 3ab - 2b^2$
and $2(2a^2 + ab)^2$

5. A bag contained ten dollars in dimes and quarters, after 17 dimes and 6 quarters were taken out, three times as many quarters as dimes were left. Find the number of each.

6. Find the square root of

$$4a^4 + 9\left(a^2 + \frac{1}{a^2}\right) + 12a\left(a^2+1\right) + 16.$$

7. Solve $\frac{37}{X^2-5X+6} + \frac{4}{X-2} \quad \frac{7}{3-X}$

8. I bought a horse and carriage for $450. I sold the horse for a gain of 5 per cent. and the carriage at a gain of 20 per cent., making a gain of 10 per cent. on the whole. Find the cost of the horse.

LOGARITHMS.

1. (a) Prove that the $\log_a \frac{m}{n} = \log_a m - \log_a n$.

(b) Prove that the $\log_a m^r = r, \log_a m$.

(c) The characteristic of the logarithm of a decimal fraction is greater by unity than the number of ciphers immediately after the decimal point.

2. Write down the characteristics of log. 3174, .000135, and 625.7.

3. Given $\log 2 = .3010300$
$\log 3 = .4771213$
$\log 7 = .8450980$

3. (a) Find value of $\log 8400$

(b) $\log 3\sqrt{392}$

(c) $\log (.0045)^{-\frac{1}{9}}$

PLANE TRIGONOMETRY.

Time, 3 hours.

1. (a) $\text{Sin } (90 - A) = \text{Cos } A$, $\text{Cos } (90 + A) = -\text{Sin } A$

(b) $\text{Sin } (A + B) \text{ Sin } (A - B) = \text{Sin}^2 A - \text{Sin}^2 B$

2. In every triangle each side is equal to the sum of the products of each of the other sides into the cosine of the angles it makes with that side.

3. Two sides of a triangle are in the ratio of 9 to 7 and the included angle 64° 12′. Find the other angles.

4. $a = 49.23$, $b = 63.75$, $c = 29.6$. Find the angles a, b and c.

SPHERICAL.

5. (a) Given $a = 37° 48′ 12″$, $b = 59° 44′ 16″$, $c = 90°$. Find c.

(b) Deduce formula or prove rule for solution of above.

6. Given $a = 70° 14′ 20″$, $b = 49° 24′ 10″$, $c = 38° 46′ 10″$. Find the angle a.

7. The sines of the angle of a spherical triangle are proportional to the sines of the opposite side.

MENSURATION.

1. Define the following:—Polygon, rectangle, trapezoid, diagonal, hypotenuse, obtuse angle.

2. Determine the hypotenuse from the given sides in a right angled triangle one side being 532 feet and the other 165 feet.

3. A rectangular field is 300 yards long and 200 yards broad, find the distance from corner to corner. If a belt of apple trees 30 yards wide be planted round the field find the area of the interior space.

4. Lay out 100 acres in the form of a circle. Give rules for finding diameter and circumference.

5. Find the area of a triangular field the sides of which are 20, 30, 40 chains respectively.

LINEAR DRAWING.

All your work must be carefully drawn in ink and construction shewn in dotted lines.

1. Construct a diagonal scale one chain to one inch, to read chains and links, and print over it "Scale of Chains."

2. The representative fraction of a plan is $\frac{1}{2376}$, construct a scale for this plan to read to 10 feet. Print over it "Scale of Feet."

3. Draw a line one inch long and on it construct a regular octagon.

4. Draw a tangent to an arc of a circle at any point, when the centre cannot be obtained or used.

5. Describe an equilateral triangle in a square whose side is three inches, without using a protractor.

6. Make a small sketch shewing houses, pine trees, maple trees, hills, roads and water.

EUCLID

1. (a) If from the ends of the sides of a triangle, there shall be drawn two straight lines to a point within the triangle, these shall be less than the other two sides of a triangle, but shall contain a greater angle.

(b) What positive property has a point?

(c) Shew how many kinds of triangles there are according to the variations both of the sides and angles.

2. If the side of the triangle be produced the exterior angle is equal to the two interior opposite angles.

(a) All the interior angles of any rectilinear figure together with four right angles are equal to twice as many right angles as the figure has sides.

3. Divide a given straight line into two parts so that the rectangle contained by the whole line and one part shall be equal to the square on the other part.

(a) Solve this problem algebraically.

4. Describe a square that shall be equal to a given rectilineal figure.

5. Define the meaning of rectangle, rhomboid, rhombus, segment, sector, pentagon and quadrant.

6. The opposite sides and angles of a quadrilateral figure inscribed in a circle are equal to two right angles.

7. Draw a straight line from a given point either without or in the circumference which shall touch a given circle.

(a) Shew that a straight line cannot be drawn to touch a circle from a given point within it.

8. Inscribe a circle in a given triangle.

(a) When is a circle said to be inscribed within and circumscribed about a rectilineal figure?

9. Describe a square about a given triangle.

10. What relation exists between the square inscribed within and the square circumscribed about the same circle?

ENGLISH GRAMMAR.

1. About what period did the English language entirely supplant the Norman French.

2. What writer did most to establish early English literature, mention his principal writings and when he flourished.

3. The kinds of words described as parts of speech can be separated into three well marked divisions. What are they?

4. Certain differences of meaning in the verb are indicated by a change of mood. What moods are there? Give sentences illustrating them.

5. From what source in our language did inflection come? What is the base or stem of inflection in nouns, pronouns and what in verbs.

6. How many kinds of sentences are there? Give illustrations.

7. Give the derivations of the following words: Huzzy, bridal, orchard, nostrils, steward.

CANADIAN HISTORY.

1. Give the date of the "Treaty of Paris" and state a few of the important terms of said Treaty and state outlines of the country ceded to England and the form of government established by England by proclamation of George III and how did it work.

2. Give date of the "Quebec Act." What kind of government was established by it and what were the boundaries of Quebec under this Act?

3. What laws were enforced by said "Quebec Act," how was taxation levied? How was the Roman Catholic Church provided for by this Act? How did the American Revolution affect the loyalty of the Canadians.

4. When were the Provinces of Lower Canada and Upper Canada formed? Give date of the Constitutional Act; what form of government was established by it? Where did the first parliament of Upper Canada meet and who was its first Lieutenant-Governor?

5. Who were the United Empire Loyalists, give the cause of their emigration and in which parts of Upper and Lower Canada did they settle and about what date? How were they treated by the British Government?

GEOGRAPHY.

1. State briefly the products of each of the following Provinces, namely:—British Columbia, Alberta, Ontario, Quebec and Nova Scotia. (8)

2. What are the three chief cities of each of the above Provinces? (7)

3. Give a short description of the Grand Trunk Pacific Railway. (5)

4. How does Canada's foreign trade and population compare with that of the United States. (5)

5. Name the three chief commercial seaports of North America. (5)

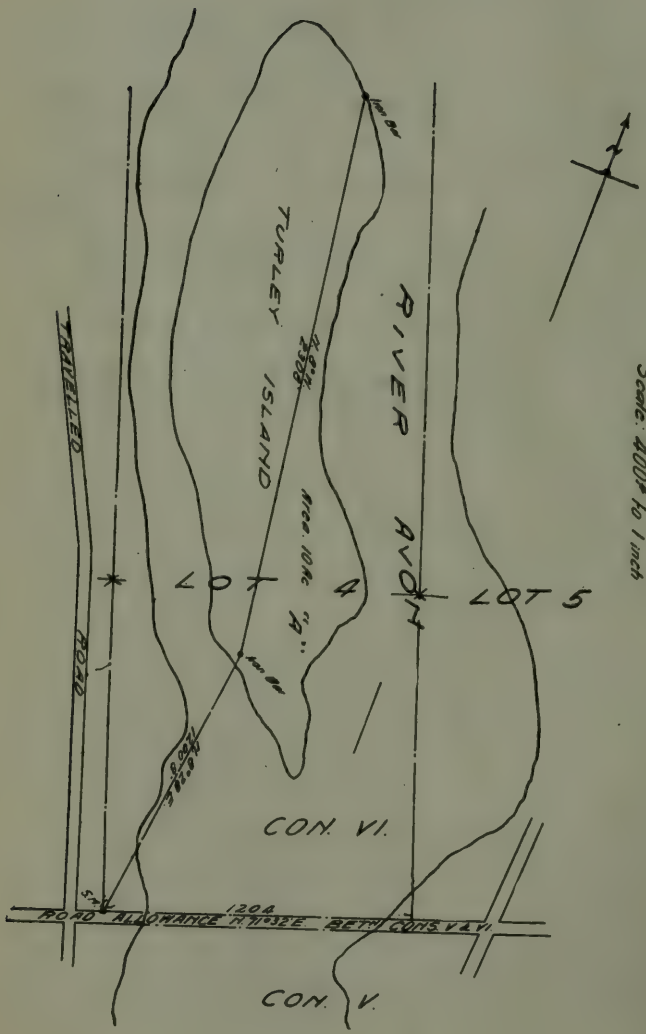
6. Which are the two largest navigable rivers in South America also the two largest cities. (5)

7. What mountain range separates Spain from France? (5)

8. What are the two chief commercial seaports in each of the following countries, namely:—Great Britain, Germany, Holland, Belgium and France. (10)

FINAL EXAMINATION, FEBRUARY 1911.

DESCRIPTIONS.



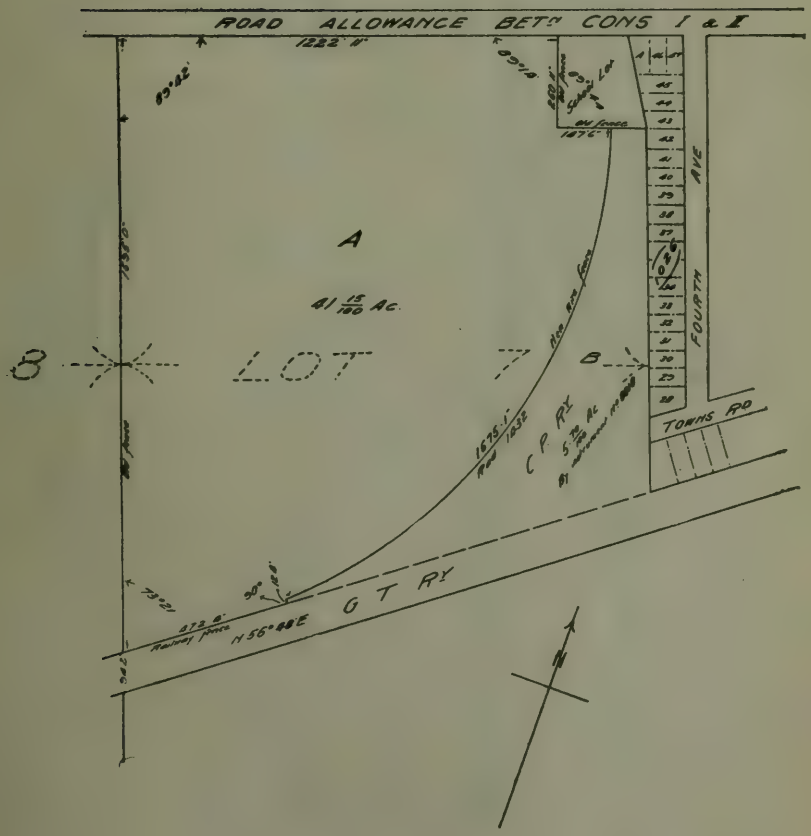
DESCRIBE "A"

Sketch Shewing

Part of Lot 7 Con. 1. S. Division, fronting the Lake

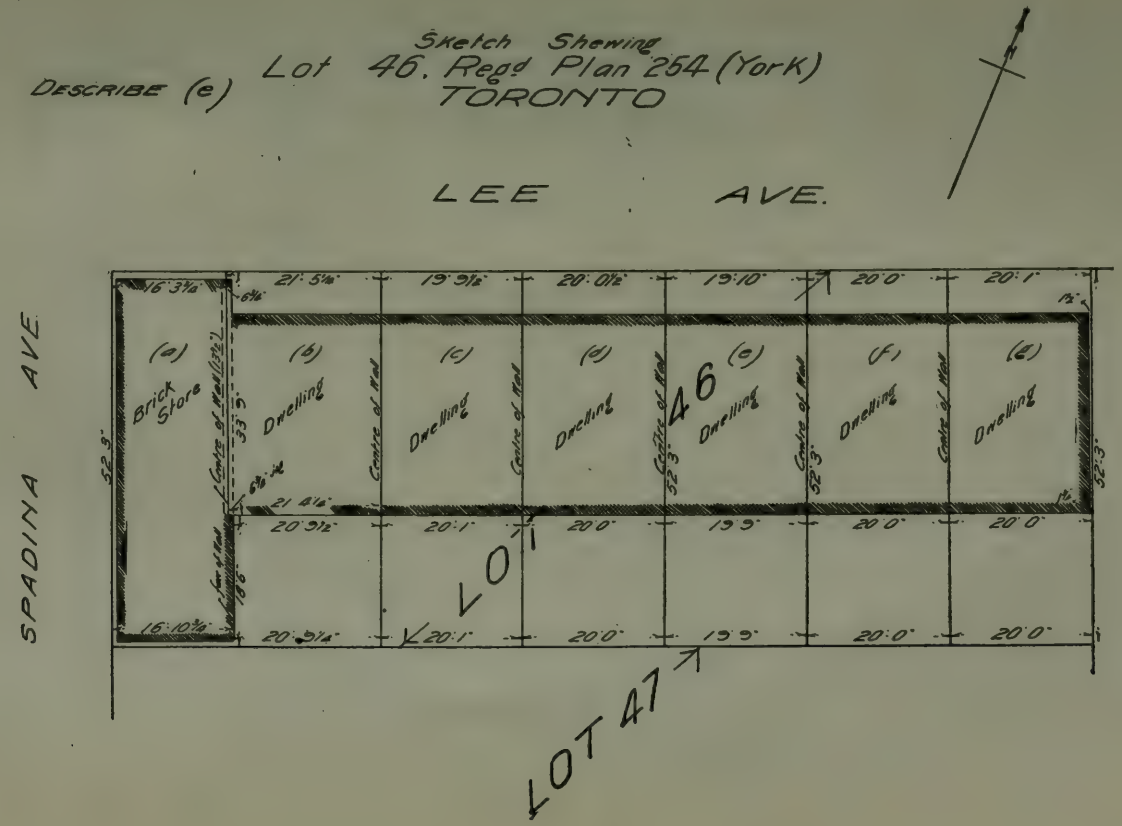
Tp of Etobicoke

YORK

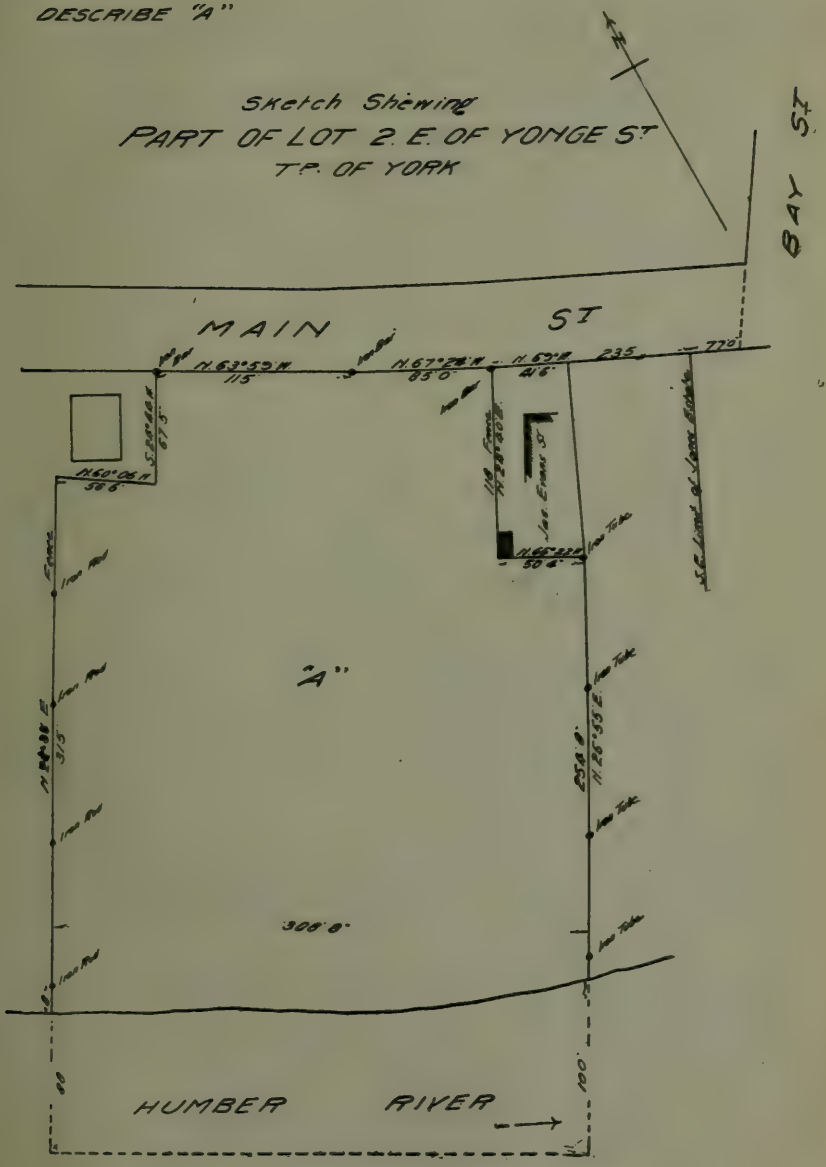


Sketch Shewing

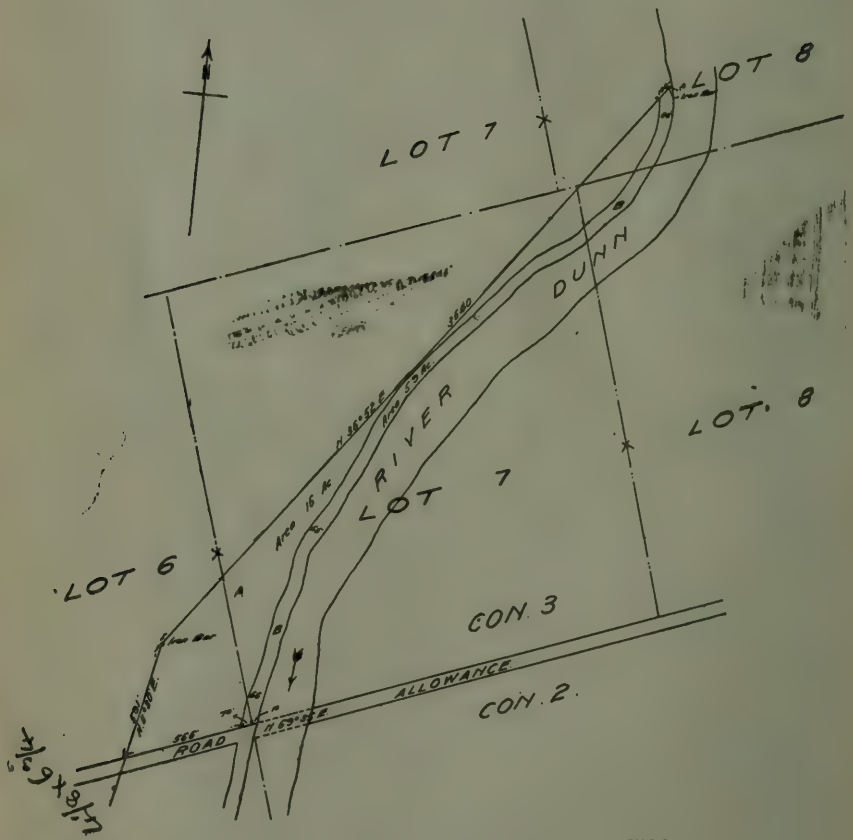
DESCRIBE (e) Lot 46. Regd Plan 254 (York) TORONTO



DESCRIBE "A"


Sketch Shewing
PART OF LOT 2. E. OF YONGE ST
TP. OF YORK
BAY ST
MAIN ST
N 63° 53' W
115'
N 67° 24' W
83' 0"
N 63° 18'
41' 6"
235'
77' 0"
N 60° 06' W
58' 6"
"A"
N 26° 55' E
254' 0"
300' 0"
HUMBER RIVER
100'

PLAN SHEWING
PARTS OF LOTS 6.7 & 8. CON. III.
DESCRIBE B
TP OF WARWICK
CO OF LAMBTON
Scale 400 ft to 1 in.



ALGEBRA.

1. Prove that the difference of the same powers of any two quantities is exactly divisible by the difference of those quantities.

2. Find the G. C. M. of

$$e^{2x}a^3 + e^{2x} - a^3 - 1 \text{ and } e^{2x}a^2 + 2e^x a^2 - e^{2x} - 2e^x + a^2 - 1.$$

3. Extract the cube root of

$$(a+1)^{6n}x^3 - 6ca^P\ (a+1)^{4n}\ x^2 + 12c^2\ a^{2P}\ (a+1)^{2n}x - 8c^3\ a^{3P}.$$

4. Solve the equation

$$x^{\frac{1}{2}} + (a+x)^{\frac{1}{2}} = \frac{na}{(a+)^{\frac{1}{2}}}.$$

5. Solve

$$\sqrt{a^2 - x^2} + x\sqrt{a^2 - 1} = a^2\sqrt{1 - x^2}.$$

6. $x^3 - xy^2 - x^2y + y^3 = 3xy.$
$x^6 - x^2y^4 - x^4y^2 + y^6 = 45x^2y^2.$

7. A and B start from two places, C and D, at the same time, A from C intending to pass through D, and B from D travelling in the same direction. When A overtakes B it is found that they had together travelled thirty miles; that A had passed through D four hours before; and that B was nine hours' journey from C. Find the difference between C and D and the rates of travelling of A and B.

8. The sums of two arithmetrical series each to n terms are as $(13 - 7n)$ is to $(1 + 3n)$; find the ratio of their first terms and also of their second terms.

9. If a, b, c, d be $(n + 1)$ quantities in geometrical progression, shew that the reciprocals of $a^2 - b^2$, $b^2 - c^2$, $c^2 - d^2$, etc., are also in geometrical progression and find the sum of the latter series.

10. Find the sum of $\frac{1}{1.3} + \frac{1}{2.4} + \frac{1}{3.5}$, etc., to infinity.

PLANE TRIGONOMETRY.

1. (a) Given $\tan o = \frac{1}{2}$, find the values of the other trigonometrical ratios.

Prove that

(b) $\text{Sin}\,(180° - A) = -\text{Sin}\,A$.

(c) $\text{Sec}^2 A = 1 + \tan^2 A$.

(d) $\text{Sin}\,(A + B) = \text{Sin}\,A\,\text{Cos}\,B + \text{Cos}\,A\,\text{sin}\,B$.

2. Define the circular measure of an angle.

(a) Find the circular measure of an angle of 49° 41′ 15″.

(b) Find the number of degrees, minutes and seconds in $\frac{17}{32}$ circular measure.

3. In an isosceles triangle, the length of each of the equal sides is 235.39 and the vertical angle is 58° 14′. Find the length of the base.

4. (a) In a plane triangle A, B, C prove that the area of a triangle is $\frac{1}{2} \cdot b\,c \sin A$.

(b) $\sin \frac{A}{2} = \sqrt{\frac{(s-b)(s-c)}{b\,c}}$.

5. In a triangle $a = 116$, $b = 144$, $c = 73.8$. Find area of triangle and angle C.

6. Standing at a certain point I observe the elevation of a house is 50° 15′ and that the sill of one of its windows known to be 20 feet above the ground subtends an angle of 20° from the same point. Find the height of the house.

SPHERICAL.

1. (a) Explain the meaning of the terms:—Spherical excess and polar triangle.

(b) Prove that the sides and angles of the polar triangle are respectively the supplements of the angles and sides of the primitive triangle.

(c) The three angles of a spherical triangle are together greater than two right angles.

2. Enumerate Napier's Analogies.

3. In a spherical triangle A, B, C. Given $a = 37° 48′ 12″$, $b = 59° 44′ 16″$, $c = 90°$. Find c and a.

4. Given $a = 70° 14′ 20″$, $b = 49° 24′ 10″$, $c = 38° 46′ 10″$. Find A.

ASTRONOMY.

1. Define azimuth, altitude, amplitude right ascension, declination, vernal equinox, hour angle, astronomic latitude, geodetic latitude, celestial latitude, terrestrial and celestial longitude.

2. Explain fully the different kinds of time in use, also the equation of time and its variation, giving a graphical representation.

3. Nov. 15th, 1910. The observed altitude of the sun's centre on the meridian was 27° 05′ 37″ and the corrected declination 18° 39′ 06″. What was the latitude?

4. Alpha Lyra, declination + 38° 41′ 37″ was observed to cross the prime vertical east of the meridian at $16^h\ 20^m\ 47^s$ siderial time and again west of the meridian at $20^h\ 39^m\ 14^s$. What was the latitude?

5.

Face	Time	H.C. Reading	Alt. Sun's Lower and Upper Limb	H.C.R. on Reference Object
R.	$9^h\ 50^m$ a.m.	52° 24′ 38″	21° 39′ 39″ ⊙	180° 03′ 12″
L.	$10^h\ 00^m$ a.m.	53° 41′ 05″	22° 41′ 41″ ⊙	180° 03′ 08″

Latitude, 44° 17′ 02.5″. Long., 78°. Sun's dec., 18° 37′ 57″. Find the sun's azimuth and the bearing of the reference object.

6. With the same data as in No. 5 find the watch correction on mean time the equation of time being $14^m\ 13^s$.

7. Observed Polaris R. A., $1^h\ 27^m\ 47^s$, Dec. 88° 49′ 59.4″, Siderial time $17^h\ 49^m\ 48^s$. Hor. Circle reading 263° 02′ 17″. Hor. Cir. reading on R. O. 180° 03′ 20″. Find azimuth of Polaris, meridian reading and bearing of the reference object.

8. Nov. 15th, 1910. Right ascension of the mean sun $15^h\ 35^m\ 36.6^s$ R. A. Polaris $1^h\ 27^m\ 48^s$, Dec. Polaris 88° 59′, Lat. 44° 17′. Find the mean time and azimuth of Polaris at eastern elongation.

MENSURATION AND DIVIDING OF LAND.

1. A footpath goes along two adjacent sides of a rectangle, one side is 196 yards and the other 147 yards. Find the saving in distance by building a new walk along the diagonal instead of along the two sides.

2. A country in the form of a rectangle 600 miles long by 200 miles broad supports a population of twenty million people. Find the average number of acres required to support one person.

3. The base of a field in the form of a trapezoid is 30 chains and the two perpendiculars are 28 chains and 16 chains respectively. It is required to divide it equally between two parties by a fence parallel to the perpendiculars. Fix point on base to start from.

4. Give rules for finding areas of a circle, a trapezoid, a triangle, a parallelogram.

5. Find area of mining claim T C 26 from the following courses and distances:—

S. 78° 10′ E. ast. 19.93 ch. N. 12° 41′ E. ast. 20.64 ch.
N. 82° 53′ W. ast. 13.59 ch. N. 71° 15′ W. 8.17 ch.
S. 3° 10′ W. ast. 3.92 ch. S. 85° 30′ W. 1 ch.
S. 8° 03′ W. ast. 16.52 ch.

GEOMETRY.

1. Describe a parallelogram equal to a given rectilineal figure and having an angle equal to a given rectilineal angle.

2. If a straight line be divided into two equal and also into two unequal parts, the squares on the two unequal parts are together double of the square on half the line and of the square of the line between the points of section.

3. Straight lines bisecting two adjacent angles of a parallelogram intersect at right angles.

4. A, B, C, D is a parallelogram, and E and F the middle points of A D and B C respectively, shew that B E and D F will trisect the diagonal A C.

5. The sum of the squares on the sides of a parallelogram is equal to the sum of the squares on the diagonals.

6. A segment of a circle being given to describe the circle of which it is a segment.

GEOMETRY (Cont'd).

7. From a given circle to cut off a segment containing an angle equal to a given rectilineal angle.

8. Let C be the centre of a given circle, C A a radius, B a point on a radius at right angles to C A, join A B and produce it to meet the circle again at D and let the tangent at D meet C B produced at E. Shew that B, D, E is an isosceles triangle.

9. Inscribe a circle in a given triangle.

10. Describe a rectilineal figure which shall be similar to one given rectilineal figure and equal to another given rectilineal figure.

CURVES.

1. Define degree of curve, external distance, long chord, point of tangent, tangent distance and middle ordinate.

2. Given the central angle of a 7° curve to be 46° 15′, find the tangent distance, the radius of the curve and the middle ordinate.

3. Find the difference between the nominal length of a railroad curve, and its true length on the arc in the case of a 9° curve, subtending a central angle of 42° 45′.

4. A 3° 30′ curve is to begin at station 142 + 45, and is to have a total central angle of 28° 30′, find the radius of the curve, the P. T. and the station at the E. C., also the station at the two tangents produced.

(b) Give the deflection angles for the first four stations beyond 142 and at the E. C.

5. Compute the ordinates and offsets for the first four stations beyond 142, in question 4, by the method of tangential offsets.

6. Given a 4° curve, commencing at station 98 + 20, and having a central angle of 38° 30′ find the radius for a change in the curve commencing at the same P. C. and ending in a parallel tangent 6.54 feet out from the present tangent, also the E. C. of the new curve.

7. Find the length of a reversed curve, joining two parallel tangents, 24 feet apart, having equal radii each 800 feet in length.

8. What method would you take to find the degree of curve of an old track where original records were lost?

SURVEY ACT.

Maximum, 150; Minimum, 90.

1. Mention the different systems of survey in Ontario.

2. What is a "double front" concession? When was the system introduced and how are lines to be run therein?

3. What system of survey prevails between the Georgian Bay and the Ottawa River? State how you would proceed to run lines therein.

4. How were townships laid out north of the Mattawa River and Lake Nipissing and how are lines to be run therein?

5. What is a "proof line" and what use would you make of it?

6. Upon what system of survey were townships laid out on Rainy River and how would you proceed to run lines therein?

MINING ACT OF ONTARIO.

1. What size, form and area should a mining claim have in unsurveyed territory?

2. How would you survey into mining claims a mining location the property of the Crown in unsurveyed territory which has been already surveyed?

3. In a township lot of 320 acres how would you divide it and describe it as mining claims?

4. In surveying a claim before the issue of patent what would you expect to find on the ground, and what would you require to file in the Department of Lands, Forests and Mines as regards your survey, and what is the mode of survey?

5. What is the rule in unsurveyed territory where a reduction has to be made owing to the staking out of a much larger area than the law permits as a mining claim?

THE REGISTRY ACT.

1. What does the Registry Act require that plans should show on them?

2. By whom should the plan before being registered be signed and certified?

3. When may a plan although registered be altered or amended?

4. What is the certificate the surveyor should put on a plan?

LEVELLING.

1. What is a level surface? When are points on the same level? Define a level line.

2. State the different kinds of instruments used in levelling and the different adjustments to be examined into before using.

3. Show by lettered diagram how the corrections for the earth's curvature and for refraction are made, in case you were required to prepare a table shewing the same.

4. How are field notes kept of a long line of railway levels; shew form of field-book and how corrections are made for earth's curvature and refraction. Shew method of checking field-notes of levels in the field.

5. What is the advantage of placing the instrument midway between points and which points? What is a datum plane or line? What is a bench mark? What is turning point? What is a profile?

6. In the course of a preliminary survey for a railway the line crosses a high ridge difficult to take levels or measure to the top. Shew by a lettered diagram how you would find the distance to and height of ridge by use of transit, the allowance for curvature of earth and refraction to be made.

PRINCIPLES OF EVIDENCE.

1. Give the meaning of the expression Principles of Evidence and state the difference between the words testimony and evidence.

2. Why is it said that "hearsay is not evidence," and under what circumstances may it be?

3. What is Primary Evidence?

4. What is Secondary Evidence? Give a list of other kinds of evidence.

5. Can a member of a firm of Ontario Land Surveyors give evidence in court as to work, notes or plans of another member of the firm and if so, under what circumstances?

6. What documents, plans, etc., can be produced in court as evidence? Give a list of the same.

PRINCIPLES OF EVIDENCE (Cont'd).

7. State the procedure in detail of oral examinations of witnesses in court.

8. Write two affidavits complete for registration as to a disputed corner of a township lot, the posts being lost; each affidavit covering two or more pages. One witness not being able to sign his name; the lot being in a double front concession in the first affidavit, the second a single front.

9. When evidence is given as to what a dead man has said, what is necessary?

GEOLOGY AND MINERALOGY.

1. Explain the following terms: outcrop dip, strike, anticlinal, synclinal, monoclinal, flexure, fracture, fault, foliated, laminated, conformable strata, erosion, denudation.

2. What names are given to the rock formations found in old Ontario? Shew by means of a table or sketch how they are distributed.

3. How are the relative ages of rocks determined and in what rocks are the first traces of animal life found?

4. Give the constituents of granite and explain the difference between granite syenite and gneiss.

5. How are rocks classified on the basis of origin?

6. Explain the origin of placers and what is meant by "pay streak" and "bench diggings."

7. How is the specific gravity of minerals determined?

8. Name localities where the following economic minerals are found in Canada:—

Gold, silver, platinum, copper, iron, nickel, galena, zinc, mica, asbestos, coal, salt, petroleum.

BOTANY AND FOREST FLORA.

Maximum, 50; Minimum, 25.

1. Describe the chief functions of the leaf in plant life. (5)

2. Describe the various methods adopted by plants for the dispersion of seeds and for self preservation. (5)

3. Name at least twelve trees common to Ontario in the relative order of their commercial value, giving some of the uses to which each is put. (15)

4. What kind of timber in Ontario is best adapted for railway ties? (7)

5. Name the varieties of pulp wood in Northern Ontario. (8)

6. How many cubic feet of pulp wood, cut in logs, constitutes a cord, by Ontario Government scaling? (5)

7. O. L. Surveyors are instructed to "mark the corners of lots by planting firmly in the ground posts made of the most durable wood to be found in the locality." From the list you have already given name the woods you would select in the relative order of their value for this purpose. (5)

MUNICIPAL DRAINAGE ACT.

1. Explain the meaning of the following terms referred to in the Municipal Drainage Act:—Initiating Municipality, Drainage Area, Benefit, Outlet Liability, Injuring Liability and Varying Assessment.

(a) What parties are entitled to sign a petition for the construction of a drain?

2. A petition was presented to the Council of the Township of Sandwich East, praying that the E. ½ of Lot 156, Con. I, also Lot 156, and the E. part of 155, Con. II., and parts of 154 and 155, Con. III. in said Township shall be drained by means of a drain. Assume that the petition was in proper form, and that you were appointed by the Council as Engineer to make a report, plans, etc., for this drain; assuming also, that having made the necessary examination and surveys, you found an old ditch constructed on the west side of the East Town Line Road from near the South Town Line to Lake St. Clair, which if deepened and enlarged would give drainage to the Drainage Area, and also for other lands further south, and some lands east of the road in Maidstone, and further, that you think it advisable to divert the Park and Brault drains into this drain by closing the culverts under the road:—

MUNICIPAL DRAINAGE ACT (Cont'd).

Write a concise report stating what you had done in the matter, your recommendations with regard to what you consider best to be done, what allowances you propose to make for bridges, road bridges, damages to land, etc., and the apportionment of the cost of the work, between the two municipalities of Sandwich East and Maidstone, and private owners. Also an itemized statement of work, shewing the cost of construction, land damages, bridges, etc., which make up the total cost of the work.

3. In your Schedule of Assessment, under what heads would you assess X and Y, Lots 151, 2nd and 3rd Concessions, supposing the average surface is 10 ft., about the grade of the East Town Line Drain, also B in Lot 9, E in Lot 6, and south part of W in Lot 154, Con. III?

4. After the report, plans, etc., have been filed with the Clerk, what further proceedings are required to be taken by the Council before the final adoption of the By-law?

5. What proceedings are required to be taken to make an Assessment on lands and roads in the Township of Maidstone?

6. What are the duties imposed on the County Judge and the Drainage Referee under the Municipal Drainage Act?

DITCHES AND WATER COURSES ACT.

1. State the limitations of the Ditches and Water Courses Act with reference to length of drain which may be constructed under this Act, the area of land which may be drained, and the total cost of the work.

2. Explain the meaning of Owner, Award, Maintenance where mentioned in the Ditches and Water Courses Act.

3. "O" the owner of the South E. ¼ of Lot 13 in the Sixth Concession of the Township of Sandwich South desires a reconsideration of the 7th Street drain award, located on the north side of the 7th Concession Road shewn on plan attached.

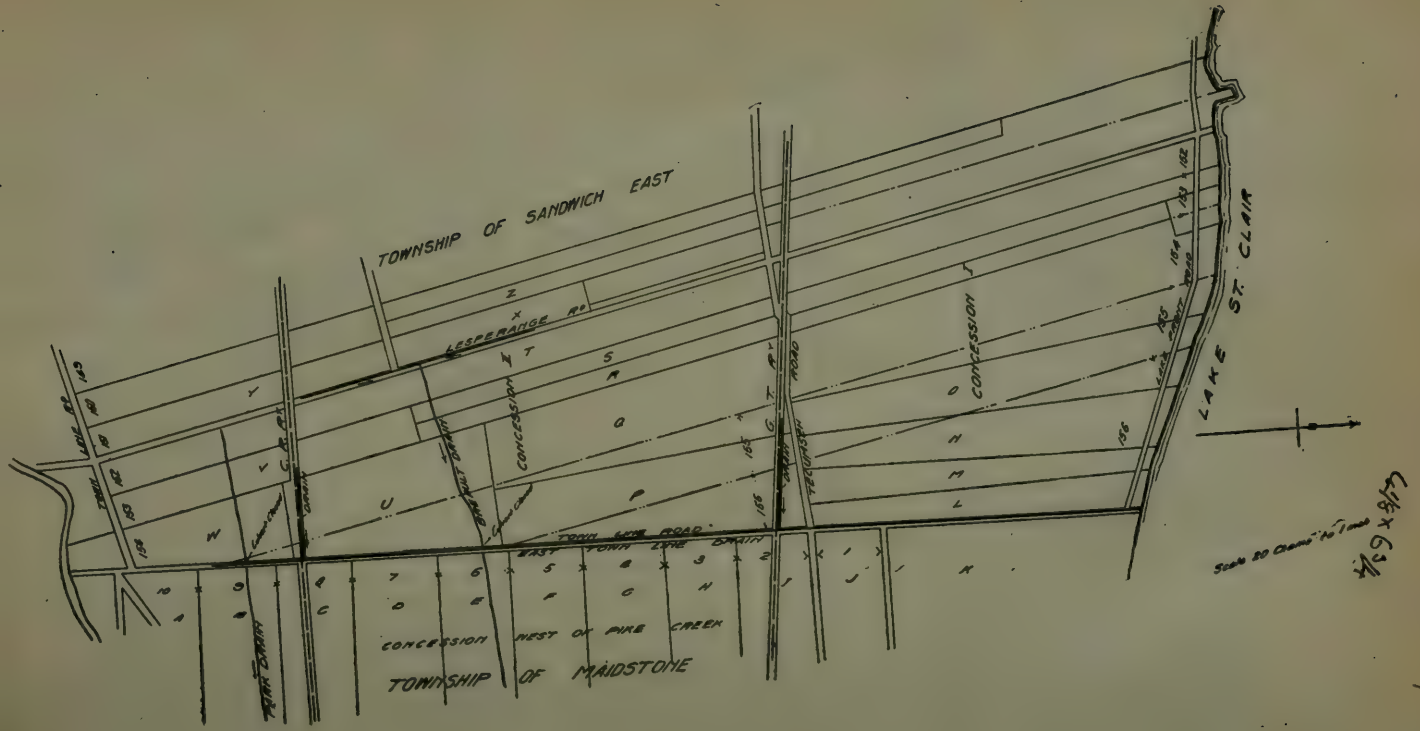
Mention the proceedings necessary to be taken by "O" in order to obtain a reconsideration of the Award, and also, the proceedings to be taken by the Engineer in case the owners fail to agree.

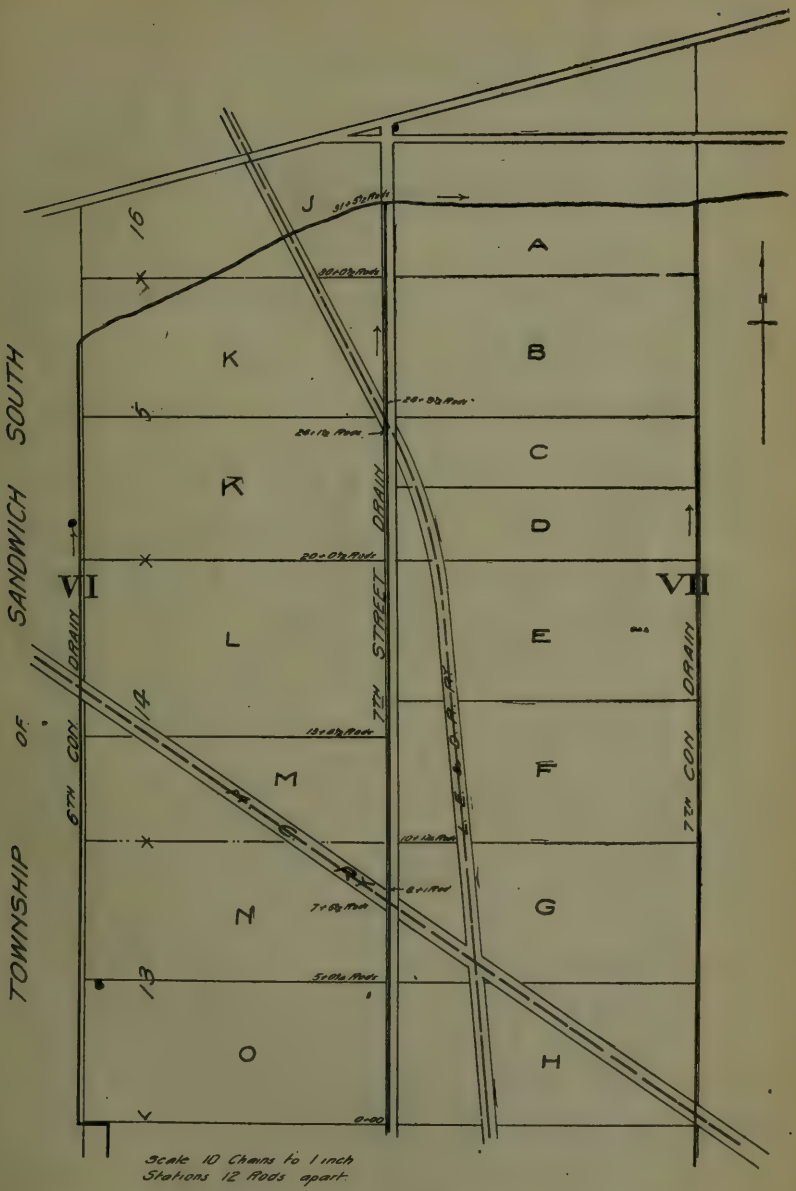
DITCHES AND WATER COURSES ACT (Cont'd).

4. Assuming the cost of the drain to be $500, that the earth shall be spread on the road and the railway companies agree to perform the work across their respective lands.

Make or write out an Award giving information you may assume regarding the drain, the portions awarded to the different owners, and other information required by the said Act, also, the value of each portion, fees to be charged, etc.

5. What further proceedings shall have to be taken if the owners L and N neglect to complete their portions within the time mentioned in the Award?


TOWNSHIP OF SANDWICH EAST
LESPERANCE Rd
CONCESSION
LAKE ST. CLAIR
EAST TOWN LINE SMITH
CONCESSION WEST OF PIKE CREEK
TOWNSHIP OF MAIDSTONE
Scale 20 Chains = 1 Inch
548 x 619


TOWNSHIP OF SANDWICH SOUTH
16
J
A
K
B
C
D
VII
L
E
VII
14
M
F
G
13
O
H
7TH STREET DRAIN
6TH CON DRAIN
7TH CON DRAIN
Scale 10 Chains to 1 inch
Stations 12 Rods apart

MEMBERS

1911

The names of those members granted exemption by By-laws ratified by the Association are marked *.

NAME AND P.O. ADDRESS. — DATE OF ADMISSION BY BOARD.

Abrey, George Spencer,
606 Indian Rd., Toronto .....6th April, 1906

Allan, John Richard, Renfrew.....6th Nov., 1894
Grad. S.P.S.

Allison, Calvin Bruce, South Woodslee 22nd Feb., 1911
D.L.S. Grad. S.P.S.

Anderson, Frederick John, Niagara Falls,
1st May, 1910

Anderson, Herbert McEwen, Dundas, 18th April, 1910

*Anderson, Ralph Mackenzie, Toronto,
16 St. Vincent St. .....2nd May, 1911
Grad. S.P.S.

Angus, George Page, North Bay ..... Apl., 1911

Ardagh, Arthur Gowan, Barrie.....18th Feb., 1908
Grad. S.P.S.

Attwood, Charles Hartley, Hamilton.
88 King Street W. ..... 22nd Feb., 1911

Aylesworth, John Sidney, Sharp's Corners, Ont.9th Jan., 1871
D.L.S.

Aylsworth, Charles Fraser, Jr., Madoc.....8th Jan., 1886
D.L.S.

Baird, Alexander, Leamington .....7th July, 1877
C.E.

Baker, Mason Herman, St. Thomas ... 16th Feb., 1909
D.L.S.

Barrow, Ernest George, Hamilton.....4th Oct., 1877
D.L.S., Mem. Can. Soc. C.E., City Engineer.

Bazett, Edward, Huntsville.....8th July, 1881
D.L.S.

Beatty, David, Parry Sound.....12th July, 1869
D.L.S.

NAME AND P.O. ADDRESS. DATE OF ADMISSION BY BOARD.

Beatty, Herbert John, Eganville.....8th Nov., 1893
Grad. S.P.S.

Bell, Andrew, Almonte..... 14th Oct., 1866
B.A., Mem. Am. Soc. C.E., Mem. Can. Soc. C.E., Mem. Ont. A.A., D.L.S.C.E.

Bell, James Anthony, St. Thomas.....11th Oct., 1875
D.L.S., Co. Engineer, Elgin; City Engineer, St. Thomas.

Bigger, Charles Albert, Ottawa, 145 Gloucester St. .....6th Jan., 1882
D.L.S., A.M. Can. Soc. C.E., B.C.S., Astronomer, Dept. Interior.

Bingham, Edwin Ralph, Fort William...17th Feb., 1906
D.L.S.

Blake, Frank Lever, Toronto, Meteorological Office .....13th April, 1875
D.L.S.

Blair, William John, New Liskeard.....13th Feb., 1904
Grad. S.P.S.

Bolton, Ellsworth Doan, Listowel.....7th Nov., 1899
B.A.Sc. (McGill).

Booth, Charles Edward Stewart, Not known .....6th April, 1882
D.L.S.

Boswell, Elias John, C.P.R., Montreal 7th Nov., 1896
Grad. S.P.S., D.L.S.

Bowman, Clemens Dersteine, West Montrose.10th July, 1879

Bowman, Herbert Joseph, Berlin.....7th Jan., 1887
D.L.S., Grad. S.P.S., Treasurer County Waterloo, Assoc. Mem. Can. Soc. C. E.

Bowman, Edgar Peterson, West Montrose..17th April, 1907

Bray, Harry Freeman, Oakville.....10th July, 1882
D.L.S.

Bray, Lennox Thompson, Vegreville, Alta.17th Feb., 1902
D.L.S.

Bray, Samuel, Ottawa, Dept. of Indian Affairs.....6th Jan., 1877
D.L.S., C.E.

Brian, Michael Edward, Windsor City Hall .....17th Feb., 1906
B. A. Sc.

Brown, David Benjamin, Box 304, Manads, Brazil, South America ..... 23rd Feb., 1904
D.L.S.

Brown, George Laing, Morrisburg.....19th Feb., 1898
Grad. S.P.S.

NAME AND P.O. ADDRESS. DATE OF ADMISSION BY BOARD.

Brown, John Alexander, Sarnia,
233 South Brock St. ..... 22nd Feb., 1911
Grad. S.P.S.

Brown, John Smith (address not known)... .8th July, 1852
D.L.S.

*Browne, Harry John, Toronto, 203 Albany Ave. ..... 6th July, 1872
C.E.

Browne, William Albert, Toronto,
18 Toronto st. .....10th April, 1876

Browne, Wm. Herbert, Toronto,
18 Toronto St. ..... 18th April, 1910

Burd, James Henry, Sudbury. ..... 2nd Oct., 1905
Grad. S.P.S.

Burgess, Edward LeRoy, Ottawa, 21 First Ave..6th May, 1905

Burt, Frederick Percy, New York, N.Y. .....8th July, 1885
President "The American Architect," Times Bldg., New York.

Burwash, Nathaniel Alfred.
113 Bloor St. W., Toronto ..... 6th May, 1905
D.L.S., Grad. S.P.S.

Bush, Clayton Elgin, Toronto,
156 Geoffrey Street..... 15th May, 1908
Grad. S.P.S.

Butler, Matthew Joseph, President
Iron and Steel Co., Sidney, N.S. 11th Jan., 1878
C.E., M.I.C.E., Mem. Am. Soc. C.E., Mem. Can. Soc. C.E.

Byrne, Thos. Henry, Ottawa. ... 24th February, 1910

Caddy, John St. Vincent, Ottawa,
327 Laurier Ave.....6th Oct., 1866
D.L.S.

Cameron, Alfred John, Peterborough.....9th April, 1889

Campbell, Alexander Stuart,
288 Queen St., Kingston. ..... 24th February, 1910

Campbell, Archibald William, Ottawa,
Deputy Minister of Railways & Canals .10th April, 1885
C. E.

Carre, Henry, 276 Albert st., Belleville,
Box 203 .....8th Nov., 1861
M.O. & Georgian Bay Canal, B.A. and C.E. (Trin. Coll., Dublin), D.L.S

*Carroll, Cyrus, (not known) ..... 10th Jan., 1860
Mem. Can. Soc. C.E., D.L.S. District Surveyor and Engineer.

NAME AND P.O. ADDRESS. DATE OF ADMISSION BY BOARD.

Casgrain, Joseph Phillippe Baby,
180 St. James St., Montreal. 5th Jan., 1887
D. L. S., P. L. S., (Que.) C. E, Assoc. Mem. Can. Soc. C. E. Chief Eng. M. & P. J. Ry., Senator.

Cavana, Allan George, Orillia.....8th July, 1876
D.L.S.

Chase, Albert Victor,
Orillia, Box, 762 ..... 21st April, 1909
Grad. S.P.S.

Chipman, Willis, Toronto, 103 Bay st. .....4th Oct., 1881
D.L.S., B.A.Sc. (McGill), Mem. Am. Soc. C.E., Mem. Can. Soc. C.E.

Christie, Uriah Wesley,
815 Somerset St., Ottawa. ..... 1st March, 1906

Clarke, Fred Fieldhouse, 22 Gibson Ave.,
Toronto, Ont. ..... 31st March, 1905
Grad. S.P.S.

Clarke, Leonard Oswald, North Bay .....14th Feb., 1903

Code, Abraham Silas, Alvinston.....14th April, 1896

Code, Samuel Barber, Smith's Falls.....1st May, 1905

Code, Thomas George,
Box 330, Cobalt ..... 17th April, 1907

Code, Robert Wilmot, Alvinston .....April, 1911

Code, Richard Stanley,
Box 330, Cobalt ..... 17th April, 1907

Cook, William Albert McMichael,
66 Brunswick Ave., Toronto .....19th April, 1910

Coltham, Jas. T., Aurora, Ont. ..... April, 1911

Cotton, Arthur Frederick,
New Westminster, B.C. ..... 11th July, 1874

Cozens, Joseph, Sault Ste. Marie.....7th July, 1875
D.L.S.

Crerar, Samuel Rutherford, Toronto,
School of Science.....1st March, 1906
D.L.S., B.A.Sc., Toronto.

Dalton, John Joseph, Weston, Ont.....11th Jan., 1878
D.T.S.

*Davidson, Alexander, Arkona.....11th Oct., 1858
D.L.S.

Davis, A.R., 146 Cottingham St., Toronto
B.A.Sc. (McGill).

NAME AND P.O. ADDRESS. DATE OF ADMISSION BY BOARD.

Davis, William Mahlon,
Prince Rupert, B.C. ..... 11th April, 1885
Grad. R.M. Coll. (Kingston), City Engineer.

Deacon, Thomas Russ, Winnipeg.....12th Nov., 1892
Grad. S.P.S.

Deans, William James, Brandon, Man....11th July, 1884
D.L.S.

DeMorest, Richard Watson, Sudbury.....9th April, 1889
M.E.

Dempster, Herbert Orville,
Gananoque. ..... 24th February, 1910

Dickson, James, Fenelon Falls.....6th April, 1867
D.L.S.

Dixon, Howard, Can. Nor. Ry., Winnipeg....14th Feb., 1903
Grad. S.P.S.

Dobie, James Samuel, Thessalon .....21st Feb., 1898
B.A.Sc. (Toronto Univ.), D.L.S.

Dunn, Thomas Hamilton, Winchester. .....14th May, 1906
Grad. S.P.S.

Eagleson, Francis Merwin,
Winchester, Ont. ..... 11th May, 1909
Grad. S.P.S.

Esten, Henry Lionel, Toronto, 157 Bay st....7th Jan., 1887

Evans, John Dunlop, Trenton.....8th July, 1864
D.L.S., Mem. Can. Soc. C.E., Chief Eng. Cent. Ont. Ry.

Fair, John, Brantford.....13th April, 1875

Fairbairn, Richard Purdom, Toronto,
452 Markham st. .....7th Oct., 1876
Surveyor for Dept. of Pub. Works, Ontario.

Fairchild, Charles Court, Brantford.....9th April, 1894
Grad. S.P.S., D.L.S.

Fairchild, William Howard, Brantford.....17th Feb., 1900

Farley, Sidney Edward, 362 Rideau St.,
Ottawa ..... 21st April, 1909
P.L.S., Que.

Farncomb, Alfred Ernest, Red Deer, Alberta.9th April, 1895
D.L.S.

Farncomb, Frederick William, London,
213 Dundas st. .....6th Nov., 1889

Fawcett, Thomas, 50 Emmett St.,
Ottawa ..... 6th Jan., 1881
Dom. Topographical Surveyor.

NAME AND P.O. ADDRESS. DATE OF ADMISSION BY BOARD

Fitton, Charles Edward, Orillia, Box 142..10th April, 1879
D.L.S.

Fitzgerald, James William, Peterborough...13th Feb., 1904

Flater, Frederick William, Chatham.....9th April, 1888

Francis, John James, Sarnia P.O.,
Box 304 .....16th Oct., 1861
D.L.S.

Fuce, Edward Oliver, Galt. .....17th Feb., 1906

Fullerton, Charles Herbert, New Liskeard....7th May, 1906
D.L.S., Grad. S.P.S.

Galbraith, William, Bracebridge.....4th April, 1883
D.L.S.

Gamble, Killaly, Toronto,
21 St. George Mansions .....6th April, 1888
D.L.S., P.L.S. (Man.), Sec. Assoc. O.L.S., Captain R.A. (Ret'd).

Gardiner, Edward, St. Catharines.....6th Jan., 1866
D.L.S.

Gaviller, Maurice, Collingwood, Box 164....6th Jan., 1866
C.E. (McGill), D.L.S.

Gibson, H. H., Willowdale, Ont. .....8th Sept., 1891

Gibson, Peter Silas, Willowdale.....19th July, 1858
C.E.M.S. (Mich. Univ.), D.L.S., Mem. Can. Soc. C.E.

Gibson, Wilbert Silas, Willowdale.....21st Feb., 1898

Gillon, Douglas John, Fort Frances.....9th Nov., 1895
Grad. R.I.E. Coll.

Graydon, Aquila Ormsby, City Engineer
London.....8th July, 1880

Grant, Russell Reeve, Toronto,
106 Warren Rd. ..... 23rd March, 1911
Grad. S.P.S.

Green, Thomas Daniel, Prescott, Ont.....7th Jan., 1885
D.L.S.

Greenlees, Alex'r Hunter, 866 Wellington
St., N., London, Ont. ..... 21st April, 1909

Griffin, Albert Dyke, B.A., Galt.....11th Nov., 1890

Halford, Abraham Joseph Bartholomew.
25 Surrey Place, Toronto. .....10th April, 1885

NAME AND P.O. ADDRESS. DATE OF ADMISSION BY BOARD.

Hanes, George Samuel,
North Vancouver, B.C.....6th May, 1905
City Engineer. Grad. S.P.S.

Hart, Milner, Toronto, 51 Yonge St. 11th July, 1863
D.L.S.

Henry, Frederick, London, Albion Bldg....7th April, 1887

Holcroft, Herbert Spencer, 182 Bloor St., W.
Toronto ..... 17th Feb., 1902
D.L.S., B.A.Sc. (Toronto Univ.).

Hopkins, Marshall Willard, Edmonton, Alta.13th Nov., 1893
D.L.S., B.A. Sc. (McGill), Assoc. Mem. Can. Soc. C.E.

Hutcheon, James, Guelph, 48 Glascow St.....10th Nov., 1891
Grad. S.P.S.

Jackson, John Edwin, Temple Bldg.,
Brantford ..... 22nd Feb., 1911
Grad. S.P.S.

Jackson, John Herbert, Niagara Falls.....16th Feb., 1901

James, Darrell Denman, Toronto,
227 George st. .....3rd Nov., 1891
D.L.S. B.A., B.A.Sc. (Toronto Univ.).

James, Silas, 227 George St., Toronto. 19th July, 1858
D.L.S.

Johnston, Herbert, Berlin.....21st Feb., 1905
Grad. S.P.S.

Johnston, Wm. James, St. Catharines. 10th May, 1910

Jones, Charles Albert, Petrolea.....8th April, 1881
D.L.S.

Jones, George Samuel, (not known)..... 21st April, 1909
Grad. S.P.S.

Jones, John Henry, Sarnia, Box 194.....10th Oct., 1886
D.L.S.

Jones, Thomas Henry, Brantford.....10th Oct., 1878
B.A.Sc. (McGill), D.L.S., City Engineer.

Jupp, Albert Ernest, Toronto,
165 Bolton Ave. ..... 22nd Feb., 1911
Grad. S.P.S.

*Keefer, Thomas Coltrin, Rockliffe Manor
House, Ottawa .....14th Aug., 1840
D.L.S., C.E.

NAME AND P.O. ADDRESS. DATE OF ADMISSION BY BOARD.

Kirkpatrick, George Brownly, Toronto,
Dept. of Lands, Forests and Mines.....13th April, 1863
D.L.S., Director of Surveys.

Laird, James Stewart, Essex.....6th April, 1867
D.L.S.

Laird, Robert, Haileybury.....11th Nov., 1887
Grad. S.P.S.

Lang, John Leiper, Toronto, 20 Leopold St....2nd May, 1908

Lawe, Henry, Ottawa. .....6th Oct., 1860

Lee, Roger Melville, Galt..... 19th April, 1910
D.L.S., S.L.S.

Le May, Tracy Deavin, Toronto,
83 Huntley Street ..... 1st May, 1909
City Surveyor.

Lewis, John Bower, Ottawa, Brunswick
House .....4th Oct., 1883
D.L.S., P.L.S. (Quebec), C.E.

Lougheed, Aaron, Port Arthur.....12th Nov., 1888
D.L.S.

Low, Edward Hamilton, Sudbury. .....17th Feb., 1902
Grad. R.M.C. (Kingston).

*Low, Nathaniel Edward, Sarnia.....11th July, 1856
D.L.S.

Lumsden, Hugh David, St. Andrews, N.B. 4th Jan., 1866
C.E., D.L.S., M.I.C.E., Mem. Can. Soc. C.E.

MacKay, James John, Hamilton
7 Hughson St. .....25th Feb., 1899

MacKenzie, William, Sarnia .....11th April, 1896
Grad. R.M.C. (Kingston).

MacKenzie, William Lyon,
Can. Nor. Ry., Winnipeg. ..... 7th April, 1887
C.E.

McAuslan, Herbert James, North Bay.....19th Feb., 1906
D.L.S., B.A.Sc. (Toronto).

McCaw, Robert Daniel, Sidney,
Vancouver Island, B.C. ..... 16th Feb., 1907
D.L.S.

McColl, Charles Ross, Walkerville,.....4th May, 1909
Grad. S.P.S.

NAME AND P.O. ADDRESS. DATE OF ADMISSION BY BOARD.

McCubbin, George Albert, St. Thomas,
City Engineer's Office .....9th Nov., 1895
Assistant City Engineer.

McDowall, Robert, Owen Sound.....11th Nov., 1890
Grad. S.P.S., Town Engineer.

McEvoy, Henry Robinson, St. Mary's.....10th July, 1875
D.L.S.

McFadden, Moses (not known). ..... 13th April, 1858
D.L.S., P.L.S. (Man.).

McFarlen, George Walter, Toronto, City Hall,
City Engineer's Office.....11th Nov. 1858
Grad. S.P.S.

McGeorge, William Graham, Chatham,
161 Queen St. ..... 22nd Feb., 1911
Grad. S.P.S. D.L.S.

McKay, Owen, Walkerville, Ont., Box 324.....7th Jan., 1887
M.C.S.C.E., Grad. S.P.S.

McLean, James Keachie, Ottawa, Dept.
Indian Affairs.....8th April, 1876
D.L.S.

McLean, William Arthur, Toronto,
Parliament Buildings.....21st Feb., 1898
A. M. Can. Soc. C. E., Engineer of Highways.

McLennan, Murdoch John, Williamstown...13th Nov., 1893
B.A.Sc. (McGill), D.L.S.

McMeekin, Albert, Kenora ....22nd Feb., 1911

McMullen, William Ernest, Frederickton, N.B.
Dept. Crown Lands .....11th Nov., 1892

McNab, John Duncan (not known).....9th Oct., 1879

McNaughton, Alexander Lorne, Cornwall.....May, 1905

McNaughton, Finlay Donald, Cornwall.....25th Feb., 1899

McPherson, Charles Wilfrid, Dawson, N.W.T.
Director of Surveys, Yukon.....21st Feb., 1899
D.L.S.

McPhillips, George, Winnipeg, Man.....9th July, 1885
D.L.S., P.L.S. (Man.).

Manigault, William Mazyck, Strathroy,
P.O. Box 300 .....8th July, 1876

Miller, Frederick Fraser, Napanee.....8th Jan., 1885
D.L.S.

NAME AND P.O. ADDRESS. DATE OF ADMISSION BY BOARD.

Montgomery, Royal Harp, Prince Albert, Sask. 6th May, 1905
D.L.S.

Moore, John MacKenzie, London,
Albion Building ..... 9th Oct., 1879

Moore, John Harrison, Smith's Falls..... 11th Nov., 1889
Grad. S.P.S.

Moore, William James, Pembroke ..... 18th Feb., 1908

Morris, James Lewis, Pembroke..... 7th July, 1886
D.L.S., C.E. (Toronto Univ.).

Mountain, George Alphonse, Ottawa..... 9th Jan., 1884
Mem. Can. Soc. C.E., D.L.S., P.L.S. (Que.), Engineer for Railway Commission.

Murdoch, William, Bowmanville ..... 10th Jan., 1860
D.L.S., C.E.

Murphy, Charles Joseph, Toronto,
157 Bay st. ..... 6th Oct., 1886

Nash, Thomas Webb, Kingston..... 7th April, 1854
D.L.S.

Neelands, Ernest Wesley,
New Liskeard, Ont. ..... 16th Feb., 1909
Grad. S.P.S.

Newman, John James, Windsor..... 21st Feb., 1898

Newman, William, Windsor,
57 Sandwich st. w. ..... 12th Nov., 1892
Grad. S.P.S.

Ogilvie, William, 615 North 18th St.,
Paris, Texas. ..... 12th July, 1869
D.L.S.

O'Hara, Walter Francis, 236 Waverly St.,
Ottawa..... 14th April, 1892
D.L.S.

Ord, Lewis Redman, Hamilton,
c.o. Traders Bank ..... 8th January, 1885
D.L.S.

Parsons, Johnston Lindsey Rowlett,
Regina, Sask., Box 1004..... 6th May, 1905
D.L.S., Grad. S.P.S.

Patten, Thaddeus James, Little Current..... 5th Jan., 1883
D.L.S.

NAME AND P.O. ADDRESS. DATE OF ADMISSION BY BOARD.

Patterson, Frank Elliott,
Sudbury. Ont. .....21st April, 1909
Grad. S.P.S.

Paulin, Frederick William,
Niagara Falls ..... 11th May, 1908
Grad. S.P.S., Toronto.

Peckover, Horace Joseph,
209 Major St., Toronto. ..... 24th February, 1910
B.A.Sc., Toronto.

Pequegnat, Marcel, Berlin, Ont. 24th February, 1910
B.A.Sc., Toronto

Phillips, Henry Percy Argall,
Porcupine ..... 24th February, 1910

Pierce, John Wesley, Haileybury. ..... 20th Feb., 1909
D.L.S.

Pinhey, Charles Herbert, Ottawa,
110 Wellington st. .....12th Nov., 1888
D.L.S., Grad. S.P.S., Assoc. Mem. Can. Soc. C.E.

Proudfoot, Hume Blake, Ottawa ..... 6th Jan., 1882
B.A.Sc. (Toronto Univ.).

Rainboth, Edward Joseph, Ottawa.....11th Nov., 1887
D.L.S.

Ransom, John Thomas, Toronto,
470 Manning Ave. ..... 22nd Feb., 1911
D.L.S. B.A.Sc.

Reinhardt, Carl, Box 303, Cobalt.....25th Feb., 1899
B.A.Sc., McGill.

Robertson, James,
1170 Yonge St., Toronto ..... 11th July, 1885
Grad. S.P.S.

Roger, Alec, Ottawa South,
36 Seneca St. .....22nd Feb., 1911

Roger, John, Mitchell .....10th Nov., 1888
Grad. S.P.S.

Rogers, Richard Birdsall, Peterborough.....9th Jan., 1879
B.A.Sc. (McGill), D.L.S.

*Rombough, William R. (not known) 14 Nov., 1848
D.L.S.

Rorke, Louis Valentine, Toronto,
199 Madison Ave., Inspector of Surveys ..14th April, 1890
Grad. S.P.S., D.L.S.

NAME AND P.O. ADDRESS. DATE OF ADMISSION BY BOARD.

Ross, George, Welland .....10th July, 1879
A.M. Can. Soc. C.E., B.A.Sc. (McGill), D.L.S.

Ross, Kenneth George, Sault Ste. Marie...15th May, 1909
Grad. S.P.S.

Routly, Herbert Thomas, Haileybury..... 1st May, 1907
Grad. S.P.S.

Russell, Alexander Lord, Port Arthur.....16th April, 1873
D.L.S., P.L.S. (Que.).

Rutherford, T. N. . . ..18th May, 1906

*Scane, Thomas, Ridgetown .....7th Jan., 1865
D.L.S.

Seager, Edmund, Kenora ..... 8th July, 1861
D.L.S.

Sewell, Henry DeQuincy, Toronto,
34 Yonge st.....9th July, 1885
D.L.S., A.M.I.C.E.

Seymour, Horace Llewellyn, Edmonton, Alta..2nd May, 1908
D.L.S.

Shaw, John Henry, North Bay.....17th Feb., 1900
Grad. S.P.S.

Silvester, George Ernest, Sudbury.....12th Nov., 1892
Grad. S.P.S.

Sing, Josiah Gershom, Toronto, Room 71,
Confederation Life Building .....9th Jan., 1879
D.L.S., C.E., Public Works Dept.

Slater, Nicholas James, Ottawa,
193 Sparks St. ..... 22nd Feb., 1911

Smith, Angus, Regina .....14th April, 1896
Grad. S.P.S., City Engineer.

Smith, Charles Campbell,
Observatory, Ottawa. ..... 16th Feb., 1907
D.L.S.

Smith, George, Box 25, Lindsay.....7th April, 1881
Engineer for Co. Victoria and four Townships.

Smith, James Herbert, New Liskeard.....27th Dec., 1904

Smith, Walter, Lindsay.....16th Feb., 1907

Snow, Ernest Arthur, Berlin ..... 18th April, 1910

Speight, Thomas Bailey, Toronto,
703 Temple Building .....6th Jan., 1882
D.L.S.

NAME AND P.O. ADDRESS. DATE OF ADMISSION BY BOARD.

Steele, David Layton, Meaford. .....May, 1905

Steele, Ira John, Ottawa,
18 Rideau Terrace ..... 18th April, 1910
D.L.S.

*Stewart, George Alexander,.....8th July, 1852
D.L.S.

Stewart, John, (address not known).....11th Nov., 1887
D.L.S.

Stewart, Lionel Douglas Noble,
Collingwood ..... 24th February, 1910

Stewart, Walter Edgar, Aylmer .....12th April, 1892

Stull, William Walter, Sudbury .....17th Feb., 1900
B.A.Sc. (Toronto Univ.).

Summers, Gordon Foster, Winchester.....11th May, 1908
Grad. S.P.S., Toronto.

Sutcliffe, Homer Wilson, Forest, Ont.....11th May, 1908
Grad. S.P.S., Toronto.

Tate, Harry William, Toronto,
224 Wright Ave. ..... 30th April, 1911
Grad. S.P.S.

Taylor, William Emerson, Toronto,
122 Yorkville Ave. .....22nd Feb., 1911
D.L.S.

Taylor, William Verner ....7th Nov., 1896
Grad. S.P.S.

Tench, William Eastwood,
210 John R. St., Detroit, Mich .....11th Jan., 1878

Townsend, David Thomas,
C. P. R. Land Dept., Winnipeg. ..... 17th Feb., 1906
D.L.S., B.A.Sc., Toronto.

Traynor, Isaac, Dundalk .....16th April, 1873
D.L.S.

Turnbull, Thomas, Winnipeg, Man.,
C. N. R. Eng. Office.... .....6th July, 1878
D.L.S., C.E. (Toronto Univ.).

Tyrrell, James Williams, Hamilton, Ont.
Prov. & Loan Chambers.
7 Hughson St. S. ..... 8th April, 1885
C.E. (Toronto Univ.), D.L.S., Co. Eng. for Wentworth.

NAME AND P.O. ADDRESS. DATE OF ADMISSION BY BOARD.

*Unwin, Charles, Toronto, 126 Seaton st....12th April, 1852
D.L.S., City Surveyor.

Ure, Frederick John, Woodstock .....7th April, 1887
D.L.S.

van Nostrand, Arthur J., Toronto.
703 Temple Building..... 30th Oct., 1882
D.L.S.

van Nostrand, John, Toronto,
703 Temple Bldg. ..... 1st May, 1910

Waddell, William Henry, Edmonton, Alta..... May, 1905
D.L.S.

Wadsworth, Vernon Bayley, Toronto,
51 Yonge St. .....9th April, 1864
D.L.S.

Walker, Alfred Paverley, Toronto, Room 508,
Union Station, C. P. Ry., Eng. Office.....6th Jan., 1882
D.L.S., Mem. Can. Soc. C.E.

Ward, Archeson Thomas,
Toronto, 703 Temple Building .....10th April, 1897

Warren, James, Walkerton, P.O. Box 190....7th Oct., 1864
D.L.S.

Watson, John McCormack, Orillia,
P.O. Box 224 .....13th April, 1892

Wells, Arthur Frederick, Sandwich, Ont...17th Feb., 1906

*Wetherald, Thomas, 210 Delatre St.,
Woodstock ..... 12th Jan., 1856
D.L.S., C.E.

Weekes, Melville Bell, Brantford .....17th Feb., 1900
B.A.Sc. (Toronto Univ.), D.L.S.

West, Robert Francis, Orangeville .....7th April, 1881

Wheelock, Charles Richard, Orangeville.....7th Jan., 1886
Treasurer County of Dufferin.

WHITSON, JAMES FRANCIS, Toronto,
Dept. of Lands, Forests and Mines....9th Jan., 1886
President Assoc. O.L.S.

Wiggins, Thos. Henry, Finch, Ont.....10th Nov. 1891
Grad. S.P.S.

Wilde, John Absalom, Sault Ste. Marie, 9th April, 1893

NAME AND P.O. ADDRESS. DATE OF ADMISSION BY BOARD.

Wilkie, Edward Thomson, Toronto ... ..11th April, 1891
D.L.S.

Wilkins, Frederick William,
Norwood, Ont.....6th Jan., 1877
D.T.S.

Williams, David, Port Arthur. .....9th April, 1864
D.L.S.

Wilson, Norman Douglas,
41 Murray St., Toronto. ... 24th February, 1910
B.A.Sc., D.L.S., A.M. Can. Soc. C.E.

*Winter, Henry, Thornyhurst .....11th July, 1853
D.L.S., C.E.

*Yarnold, William Edward, Port Perry,
P.O. Box 44 .....7th April, 1854
D.L.S.

REGISTERED AND WITHDRAWN FROM PRACTICE

The names of those who have become "Associates" under By-law No. 39 are marked *; and under By-law No. 45 are marked †.

NAME AND P.O. ADDRESS. DATE OF ADMISSION BY BOARD.

Anderson, John Drummond, Trail, B.C....13th April, 1892

Anderson, William Beaumont, Halifax, N.S. .....14th Feb., 1903
Grad. R.M.C., B.A.Sc. (McGill), M. Can. Soc. C.E., D.L.S. R.C.E.

Apsey, John Fletcher, (not known) ... 6th Jan., 1886
Grad. S.P.S.

Aylsworth, Charles Fraser, Sr., Madoc.....2nd April, 1861
D.L.S.

Bowman, Arthur Meyer, Mahan, Beaver Co., Pa. .....11th Nov., 1887
Grad. S.P.S., Staff of U. S. Engineers.

Bowman, Franklin Meyer, Bellevue, Allegheny Co., Pa. .....11th April, 1892
Grad. S.P.S., Engineer Structural Iron Works.

Brady, James, Victoria, B.C., P.O. Box 815..15th July, 1862
M.E.

Burnet, Hugh, Victoria, B.C.....5th April, 1887
D.L.S., P.L.S. (B.C.).

Cambie, Henry John, Vancouver, B.C.....8th July, 1861
D.L.S., P.L.S. (B.C.).

Carbert, J. Alfred, Medicine Hat, Assa....7th April, 1876
Dist. Eng. and Surveyor.

Carpenter, Henry Stanley, Collingwood....25th Feb., 1899
D.L.S., B.A.Sc., Toronto.

Chalmers, John, Edmonton, Alta. ..... 11th April, 1896
Structural Engineer, Dept. Pub. Works.

Charlesworth, Lionel Clare, Edmonton, Alta. .....14th April, 1896
Grad. S.P.S., Director of Surveys, Alberta, D.L.S.

NAME AND P.O. ADDRESS. DATE OF ADMISSION BY BOARD.

Coleman, Richard Herbert, Toronto, Can. Co. Offices, Imperial Bank Chambers .....6th Oct., 1877

Drewry, William Stewart, Ottawa, Dept. of the Interior .....5th April, 1883
D.L.S.

Ducker, William A., Winnipeg, Man.....6th April, 1882
D.L.S., P.L.S. (Man.), Swamp Lands Comm'r.

Edwards, George, Thurso, P.Q.....6th Jan., 1866
D.L.S.

*Ellis, Henry Disney, Kuching, Sarawak, Borneo .....7th April, 1877
D.L.S., Commissioner of Pub. Works and Surveys.

Empey, J. M., Drawer 2081, Calgary. 16th Feb., 1907
B A.Sc., D.L.S.

Ford, Wm. Butterton, Wabana, Nfld.....21st Feb., 1898

Galbraith, John, Toronto, School of Prac. Science.....13th April, 1875
M.A., D.L.S., Prof. Engineering S.P.S.

Gibbons, James, Ottawa, Dept. of the Int..15th April, 1890
Grad. S.P.S., Dominion Topographical Surveyor.

Gibson, George, St. Catharines.....10th April, 1860
D.L.S.

*Harris, John Walter, Winnipeg, Man.....6th Oct., 1866
P.L.S. (Man.), D.L.S., Assessment Com.

*Harvey, Thomas Alexander, 239 Vernon ave., Long Island, N. Y. City.13th Nov., 1893

*Heaman, J. A. Eng. Dept., G.T.P. Ry., Winnipeg.

Henderson, Eder Eli, Henderson P.O., Maine.7th April, 1887
Grad. S.P.S.

Hermon, Ernest Bolton, Vancouver, B.C.....7th Oct., 1885
P.L.S. (B.C.), D.L.S.

Hobson, Joseph, Hamilton, 343 Bay St. S. ..... 3rd Oct., 1855
D.L.S.

Innes, William Livingstone, Simcoe.....14th April, 1892
C.E. (Toronto Univ.).

Jephson, Richard Jermy (not known). 7th April, 1877
P.L.S. (B.C.), D.L.S.

NAME AND P.O. ADDRESS. DATE OF ADMISSION BY BOARD.

Johnson, Sydney Munnings, Greenwood, B.C. 9th Nov., 1895

Johnston, Robert Thornton, 15 Union Hall St., Jamaica, New York City 9th April, 1889

Kennedy, James Henry, Keremeos, B.C. ..... 7th April, 1887
C. E. (Toronto Univ.), Chief Engineer V. V. & E. R. & N. Co.

*Kippax, Hargreaves, Huron, South Dakota. 7th July, 1877
C.E. (Toronto Univ.), Assistant to Surveyor-General.

Kirk, John Albert, Revelstoke, B.C. ..... 6th July, 1877
D.L.S., P.L.S. (B.C.).

Klotz, Otto, 437 Albert st., Ottawa ..... 6th Jan., 1867
Dom. Top. Surveyor, C.E. (Mich. Univ.), LL.D.

Lane, Andrew, Sparrow's Point, Md. ..... 4th April, 1895
Grad. S.P.S., Draftsman Maryland Steel Co.

Lendrum, Robert Watt, Strathcona, Alta. .... 8th Jan., 1874
D.L.S.

Livingstone, Thomas Chisholm, (address not known) ..... 10th Jan., 1859
D.L.S.

MacLeod, Henry Augustus F., Ottawa, 340 Cooper st. ..... 11th Oct., 1856
D.L.S., C.E.

MacPherson, Duncan, Montreal ..... 9th Jan., 1884
Grad. R.M.C., M.I.C.E., Mem. Can. Soc. C.E., Div. Eng. East Div. C.P.R., D.L.S.

McCulloch, Andrew, Lake Nelson, B.C. .....
Grad. S.P.S., Assoc. Mem. Can. Soc. C.E., City Engineer.

McGrandle, Hugh, Melaskawin, Alta. ..... 5th Jan., 1883
D.L.S.

McLennan, Roderick, Toronto ..... 20th Jan., 1846

Magrath, Charles Alexander, Lethbridge, Alta. 1st Nov., 1881
B.A.Sc. (McGill), D.L.S., P.L.S. (B.C.).

Marshall, James, Blyth. ..... 6th Oct., 1866
D.L.S.

Meadows, William Walter, c/o Director of Surveys, Regina ..... 21st Feb., 1898
D.L.S., Grad. S.P.S.

Miles, Charles Falconer, 268 Triangle st., Buffalo, N.Y. ..... 13th Jan., 1862

NAME AND P.O. ADDRESS. DATE OF ADMISSION BY BOARD.

Moore, Thos. Alexander, (not known). 12th Nov., 1892

Morris, Alfred Edmund, (not known). 10th April, 1879

Munro, John Vicar, New York, N.Y.,
359 West 31st st. .....9th April, 1895

†Paterson, James Allison. .....5th April, 1878
C.E., Mem. Can. Soc. C.E.

Pearce, William, Calgary, Alta.....12th Oct., 1872
D.L.S., P.L.S. (B.C.), Asst. B.C. Land Commissioner for C.P.R.

Reynolds, Samuel Henry, (not known).....17th July, 1880

Peterson, Peter Alexander, Montreal, P.Q...16th July, 1863
D.L.S., C.E. (Toronto Univ.)

Ponton, Archibald William, Macleod, Alta..9th April, 1880
D.L.S.

Purvis, Frank, (not known) ..... 7th April, 1875

Reid, John Lestock, Prince Albert, Sask....8th April, 1870
D.L.S.

Reiffenstein, James Henry, Ottawa,
Dept. of the Interior.....16th April, 1873
D.L.S.

Reilly, William Robinson, (not known). 7th April, 1881
D.L.S., P.L.S. (Man.).

Ritchie, Nelson Thomas, Kipiegan, Man.....9th Nov., 1888
P.L.S. (Man.)

Roberts, Vaughan Maurice, St. Catharines..5th April, 1887
D.L.S.

Robinson, Franklin Joseph, Regina.....21st Feb., 1898
Grad. S.P.S., D.L.S., Dep. Min. Pub. Works.

* Ross, Joseph Edmund, (not known) 11th Nov., 1890
D.L.S., P.L.S. (B.C.).

Sanderson, Daniel Leavens, Coral, Mich.....4th Oct., 1892

Saunders, Bryce Johnston, Edmonton, Alta—7th Jan., 1885
B.A.Sc. (McGill), D.L.S.

Shaw, Charles Aeneas, Greenwood, B.C.....6th Oct., 1877
P.L.S. (B.C.).

Sherman, Ruyter Stinson, (not known) 12th April, 1890
P.L.S. (B.C.).

Smith, Henry, Toronto, Dept. of Lands,
Forests and Mines.....8th Nov., 1861
D.L.S., Mem. Can. Soc. C.E.

NAME AND P.O. ADDRESS. DATE OF ADMISSION BY BOARD.

Stewart, Elihu, Ottawa, Dept. of Interior .....8th April, 1872
D.L.S., Chief Inspector of Forestry.

*Stewart, Louis Beaufort, Toronto,
School of Prac. Science .....6th April, 1882
Dom. Top. Surveyor, Professor of Surveying.

Tracey, Thomas Henry, (not known). 8th April, 1870
C.E., P.L.S., (B.C.), D.L.S.

Vicars, John Richard Odlum, Kamloops, B.C. 5th Jan., 1887
P.L.S. (B.C.), D.L.S.

Wallace, Charles Hugh, Castlederg,
Co. Tyrone, Ireland ..... 9th Nov., 1889
C.E., (Trin. Coll. Dublin), Dom. Top. Surveyor., Asst. Co. Surveyor.

Wallace, James Nevin, Calgary, Alta.....21st Feb., 1898
D.L.S., B.A., B.E. (Trin. Coll., Dublin).

Weekes, Abel Seneca, Glencoe .....12th April, 1890
D.L.S.

Wheeler, Arthur Oliver, Calgary, Alta. .....8th July, 1881
P.L.S. (B.C.), D.L.S., Topographer, Dept. of Interior.

Wicksteed, Henry King, Cobourg .....7th Jan., 1886
D.L.S., C.E.

SUMMARY.

Active members subject to dues	251
Active members exempted from dues	12
Withdrawn from practice (including nine Associates)	79
Dead	82
Total number enrolled since incorporation	424

DECEASED MEMBERS.

NAME	LATE RESIDENCE.	DATE OF P.L.S. CERTIFICATE.	DATE OF O.L.S. REGISTRATION.	DIED.
Abrey, George Brockitt	Toronto Junction	10th January, 1860	1892	25th June, 1906.
Aylsworth, William R.	Belleville	8th Nov., 1861	1882	22nd April, 1909.
Barrett, Russell H	Pembroke		14th February, 1903	30th January, 1905.
Beatty, Walter	Delta	19th July, 1858	1892	——— ———, 1911.
Bigger, Samuel Howell	Ottawa		26th January, 1904	7th July, 1906.
Bolger, Francis	Lindsay	10th October, 1863	1892	3rd November, 1895.
Bolger, Thomas Oliver	Kingston	6th July, 1865	1892	——— ———
Bolton, Jesse Nunn	Toronto	6th April, 1867		——— ———, 1901.
Bolton, Lewis	Listowel	9th July, 1864	1892	18th July, 1910.
Bowman, Leander Meyer	Toronto	14th April, 1892	1892	20th September, 1895.
Bray, Edgar	Oakville	6th October, 1866	1892	——— ———, 1908.
Brown, David Rose	Cornwall	10th October, 1850	1892	14th May, 1900.
Burke, William Robert	Ingersoll	5th April, 1878	1892	10th June, 1897.
Byrne, Thomas	Sault Ste. Marie	15th July 1862	1892	——— ———
Caddy, Cyprian F.	Campbellford	10th July, 1860	1892	—— August, 1905.
Caddy, Edward C.	Cobourg	18th December, 1846	1892	26th September, 1897.
Cheeseman, Thos.	Mitchell	11th July, 1856	1892	——— ———, 1905.
Coad, Richard	Glencoe	8th October, 1879	1892	17th May, 1897.
Creswicke, Henry	Barrie	8th July, 1864	1892	22nd January, 1898.
Cromwell, Joseph M. O.	Perth	1st October, 1846	1892	19th October, 1897.
Davidson, Walter Stanley	Sarnia	9th April, 1884	1882	December, 1900.
Davis, John	Alton	5th April, 1878	1892	8th November, 1907.
Deane, Michael	Windsor	26th May, 1848	1852	3rd April, 1897.
DeGurse, Joseph	Windsor	5th April, 1883	1892	22nd March, 1898.
Dobbie, Thos. Wm.	Tillsonburg	11th July, 1856	1892	——— ———, 1908.
Doupe, Joseph	Winnipeg	13th January, 1863	1892	——— ———, 1910.
Filmore, Stanley H.	St. Thomas		17th February, 1902	16th June, 1904.
FitzGerald, James William	Peterborough	13th July, 1857	1892	——— ———, 1901.
Foster, Frederick Lucas	Toronto	9th April, 1863	1892	27th July, 1899.
Fowlie, Albert	Orillia	13th January, 1863	1892	——— April, 1898.
Fraser, Charles	Waliaceburg	5th August, 1847	1892	——— ———, 1905.

Gibbs, Thomas Fraser	Adolphustown	31st May, 1841	1892	17th April, 1893.
Gibson, James Alex.	Oshawa	7th April, 1855	1892	——— ———, 1908.
Gilliland, Thomas Brown	Eugenia	11th July, 1868	1892	14th December, 1898.
Gilmour, Robert	Toronto	11th April, 1856	1892	29th December, 1903.
Hanning, Clement George	Preston	19th July, 1858	1892	7th May, 1905.
Haskins, William	Hamilton	5th July, 1855	1892	5th July, 1896.
Hermon, Royal Wilkinson	Rednersville	13th July, 1857	1892	9th February, 1907.
Hewson, Thomas Ringwood	Hamilton	6th July, 1877	1892	21st October, 1898.
Holland, Wm. Hugh	Toronto		1907 1st May	——— ———, 1908.
Howitt, Alfred	Gourock	12th January, 1856	1892	6th May, 1896.
Irwin, James Moore	Rat Portage	13th January, 1863	1892	——— ———, 1908.
Kains, Tom	Victoria	11th July, 1873		——— ———, 1901.
Kirk, Joseph Green	Stratford	16th February, 1843	1892	22nd January, 1900.
Lynch-Stauuton, Francis H.	Hamilton	11th October, 1856	1892	11th June, 1899.
Macdougall, Allan Hay	Port Arthur	4th April, 1859	1892	—— February, 1906.
MacMillan, James Alexander	Calgary	6th January, 1877	24th December, 1894	——— ———. 1898.
MacNab, John Chisholm	Hamilton	8th January, 1880	1894	16th October, 1897
McAree, John	Toronto	6th April, 1867	1894	12th December, 1903.
McCallum, James	Fort Francis	30th March, 1849	1894	—— July, 1900.
McDonel, Augustine	Chatham	11th July, 1863	1892	——— ———, 1908.
McGeorge, Wm. Graham	Chatham	8th January, 1866	1892	1st July, 1906.
McKenna, John Joseph	Dublin	9th July, 1860	1892	22nd September, 1910
McLatchie, John	Nelson, B. C.	9th January, 1864	1892	3rd February, 1908.
Malcolm, Sherman Morgan	Blenheim	18th October, 1858	1894	13th January, 1899.
Niven, Alexander	Toronto	3rd July, 1859	1892	7th May, 1911.
Ogilvie, John Henry	Rat Portage	11th April, 1876	24th April, 1894	21st September, 1898.
Pedder, James Robert	Doon	10th November, 1891	23rd December, 1892	17th January, 1897.
Pope, Robert Tyndal	Ireland	13th April, 1875		——— ———, 1905.
Proudfoot, Hart William	Saskatoon, Assa.	6th May, 1905		31st March, 1906.
Reid, James Hales	Bowmanville	6th October, 1866	1892	22nd December, 1899.
Robinson, William	London	—— May, 1846	1892	11th October, 1894.
Rubidge, Tom S.	Cornwall	9th February, 1849	1892	——— June, 1904.
Sankey, Villiers	Toronto	11th January, 1878	1892	10th July, 1905.
Schofield, Milton C.	Guelph	28th September, 1843.	1892	19th February, 1908.
Selby, Henry Walter	Toronto	8th January, 1876	1892	23rd August, 1910
Schwitzer, John Edward		16th November, 1896	1856	——— ———, 1911
Simpson, George Albert	Winnipeg	7th October, 1864	1892	8th January, 1905.

NAME	LATE RESIDENCE.	DATE OF P.L.S. CERTIFICATE.	DATE OF O.L.S. REGISTRATION.	DIED.
Spry, W.	Toronto	19th July, 1858	1892	—— ——, 1906.
Squire, Richard Herbert	Brantford	14th April, 1896	1896	—— ——, 1908.
Stacey, Albert George			1908, 30th March	—— ——, 1910.
Steele, Edward Chas	Sault. Ste. Marie	9th April, 1889	1892	—— ——, 1908.
Strange, Henry	Rockwood	30th November, 1838.	1892	March, 1908.
Strathern, John	B.C.	5th October, 1876	1892	—— ——, 1897.
Tiernan, Joseph Martin	Tilbury Centre	7th January, 1886	1892	—— December, 1900.
Thomson, Augustus Clifford	Chicago	14th January, 1861	1892	—— December, 1896.
Van Buskirk, William Fraser	Stratford	7th April, 1883	1892	30th January, 1905.
Wagner, William	Ossowo	13th April, 1858	1892	—— ——, 1901.
Walsh, Thomas William	Simcoe	25th April, 1842	1892	14th March, 1895.
Wheelock, Charles John	Orangeville	—— ——, 1856	1892	4th July, 1897.
Willson, Alfred	Toronto	6th October, 1866	1892	20th May, 1906.
Wood, Henry O.	Billings Bridge	10th October, 1855	1892	8th June, 1908.

NO. 27.

ANNUAL REPORT

OF THE ASSOCIATION OF

Ontario Land Surveyors

Organized 1886, Incorporated 1892

And PROCEEDINGS of the TWENTIETH ANNUAL MEETING since Incorporation, held at TORONTO, February 27th, 28th and 29th, 1912.

Printed for the Association by the Business Printing Co., 184 Adelaide St. W., Toronto.

Patronize Our Advertisers.

NOTICES.

MEMBERS and others will be supplied with copies of the Annual Reports for 1886, 1887, 1888, 1889, 1891, 1892, 1893, 1894, 1895, 1896, 1897, 1898, 1899, 1900, 1901, 1902, 1903, 1904, 1905, 1906, 1907, 1908, 1909, 1910, 1911 or 1912 upon remitting to the Secretary fifty cents for each copy required.

Each member of the Association is reminded of the fact that for the next Annual Meeting a good programme is most desirable, and to ensure its preparation it is not now too early to bear the matter in mind.

In addition to its use as a library, the Repository now serves as a drafting room for members when copying Crown Lands plans and notes.

Published annually by the Association of Ontario Land Surveyors. Edition, 1350 copies; price, 50 cents.

Patronize Our Advertisers.

PREFACE.

To the Members of the Association of Ontario Land Surveyors:

The Proceedings of the Association at its Twentieth Annual Meeting are herewith presented.

Respectfully submitted on behalf of the Council.

L. V. RORKE,
Secretary.

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ASSOCIATION OF

ONTARIO LAND SURVEYORS

Incorporated 1892 **Organized 23rd February, 1886**

PAST PRESIDENTS.

1886.	George B. Kirkpatrick	1899.	H. J. Bowman
1887.	George B. Kirkpatrick	1900.	George Ross
1888.	Alex. Niven	1901.	James Dickson
1889.	Alex. Niven	1902.	W. R. Aylsworth
1890.	Villiers Sankey	1903.	W. R. Aylsworth
1891.	Villiers Sankey	1904.	C. A. Jones
1892.	Elihu Stewart	1905.	J. W. Tyrrell
1893.	Elihu Stewart	1906.	O. J. Klotz
1894.	M. J. Butler	1907.	Thomas Fawcett
1895.	M. Gaviller	1908.	A. J. van Nostrand
1896.	Willis Chipman	1909.	Lewis Bolton
1897.	T. Harry Jones	1910.	H. W. Selby
1898.	P. S. Gibson	1911.	J. F. Whitson

OFFICERS FOR 1912-13

PRESIDENT

T. B. SPEIGHT.....Toronto

VICE-PRESIDENT

J. S. DOBIE.....Thessalon

CHAIRMAN OF COUNCIL

G. B. KIRKPATRICK.....Toronto

SECRETARY-TREASURER

L. V. RORKE.....Toronto

MEMBERS OF COUNCIL

Hon. W. H. Hearst, Commissioner of Lands, Forests and Mines

H. J. Beatty, Eganville
H. T. Routly, Haileybury } For term ending April, 1915

G. B. Kirkpatrick, Toronto
J. McL. Watson, Orillia } For term ending April, 1914

P. S. Gibson, Willowdale
C. H. Fullerton, New Liskeard } For term ending April, 1913

AUDITORS

J. W. Fitzgerald..... Peterboro
R. R. Grant..... Toronto

BANKERS

Imperial Bank of Canada (Yonge St. Branch).....Toronto

BOARD OF EXAMINERS

G. B. KIRKPATRICK (Chairman)

THOS. FAWCETT, Ottawa T. B. SPEIGHT, Toronto	For 3 years
G. B. KIRKPATRICK, Toronto OWEN MCKAY, Walkerville	For 2 years
P. S. GIBSON, Willowdale J. F. WHITSON, Toronto	For 1 year

L. V. RORKE, Secretary of the Board.

NOTE.—Board meets at Department of Lands, Forests and Mines, Parliament Buildings, second Monday in February, 1913.

COMMITTEE, 1912-13

STANDING

LAND SURVEYING—C. J. Murphy (Chairman), C. F. Aylsworth, H. J. Beatty, C. E. Fitton, J. W. Fitzgerald, L. V. Rorke, T. B. Speight, J. M Watson.

DRAINAGE—Geo. Ross (Chairman), M. Gaviller, J. H. Moore, J. J. Newman, M. Pequegnat, John Roger, Geo. Smith.

ENGINEERING—Owen McKay (Chairman), R. R. Grant, Jas. Hutcheon, W. A. McLean, F. N. Rutherford, J. W. Tyrrell, A. P. Walker.

TOPOGRAPHICAL SURVEY—Thos. Fawcett (Chairman), Otto J. Klotz, R. H. Montgomery, Geo. Ross, L. B. Stewart.

PUBLICATION—Killaly Gamble (Chairman), A. G. Ardagh, A. J. van Nostrand, J. F. Whitson.

ENTERTAINMENT—A. T. Ward (Chairman), G. S. Abrey, R. M. Anderson, T. D. Le May, John van Nostrand.

SPECIAL

LEGISLATION—G. B. Kirkpatrick (Chairman), J. W. Fitzgerald, James Robertson, H. T. Routly, T. B. Speight, W. W. Stull, J. F. Whitson.

REPOSITORY AND BIOGRAPHY—L. V. Rorke (Chairman), N. A. Burwash, Willis Chipman, H. L. Esten, M. Gaviller, P. S. Gibson, A. E. Jupp.

EXPLORATION—J. F. Whitson (Chairman), J. S. Dobie, R. W. De Morest, T. J. Patten, J. A. Wilde.

POLAR RESEARCH—Willis Chipman (Chairman), F. L. Blake, W. L. Malcolm, H. W. Sutcliffe, J. W. Tyrrell.

PROGRAMME OF THE

Association of Ontario Land Surveyors

(INCORPORATED)

AT ITS TWENTIETH ANNUAL MEETING HELD AT TORONTO, FEBRUARY 27th, 28th AND 29th, 1912.

PROGRAMME

Tuesday, 27th February—Morning, 10 o'clock.

IN THE ENGINEERS' CLUB.

Meeting of Council of Management.
Meeting of Standing and Special Committees.

Afternoon, 2 o'clock.

Reading of Minutes of previous meeting.
Correspondence.
President's Address. — J. F. Whitson.
Report of Council of Management.
Report of Secretary-Treasurer (including Financial Statement).
Report of Board of Examiners.
Report of Committee on Legislation. — G. B. Kirkpatrick, Chairman.
Report of Committee on Publication. — Killaly Gamble, Chairman.
Report of Committee on Topographical Survey. — Thos. Fawcett, Chairman.
Report of Committee on Exploration. — H. T. Routly, Chairman.
Paper.—"Rights of Way." — D. D. James.

Evening, 8 o'clock.

Report of Committee on Repository and Biography. — H. L. Esten, Chairman.
Report of Committee on Polar Research. — Willis Chipman, Chairman.
Paper.—"Canada's Mineral Wealth." — Dr. W. G. Miller.
Paper.—"A Trip to Hudson Bay in 1900." — L. V. Rorke.

Wednesday, 28th February—Morning, 10 o'clock.

IN THE ENGINEERS' CLUB.

Report of Committee on Engineering. — James Hutcheon, Chairman.
Paper.—"Coal Tar for Roads." — James Hutcheon.
Paper.—"Underground Surveys." — R. W. DeMorest.
Paper.—"A Mountain Railway in Norway." — C. C. James, C.M.G.
Report on Committee on Drainage. — George Ross, Chairman.
Paper.—"Conservation in Canada." — James White.
Paper.—"What Land Surveyors can do to Promote the Settlement of our Agricultural Lands in New Ontario." — J. F. Whitson.

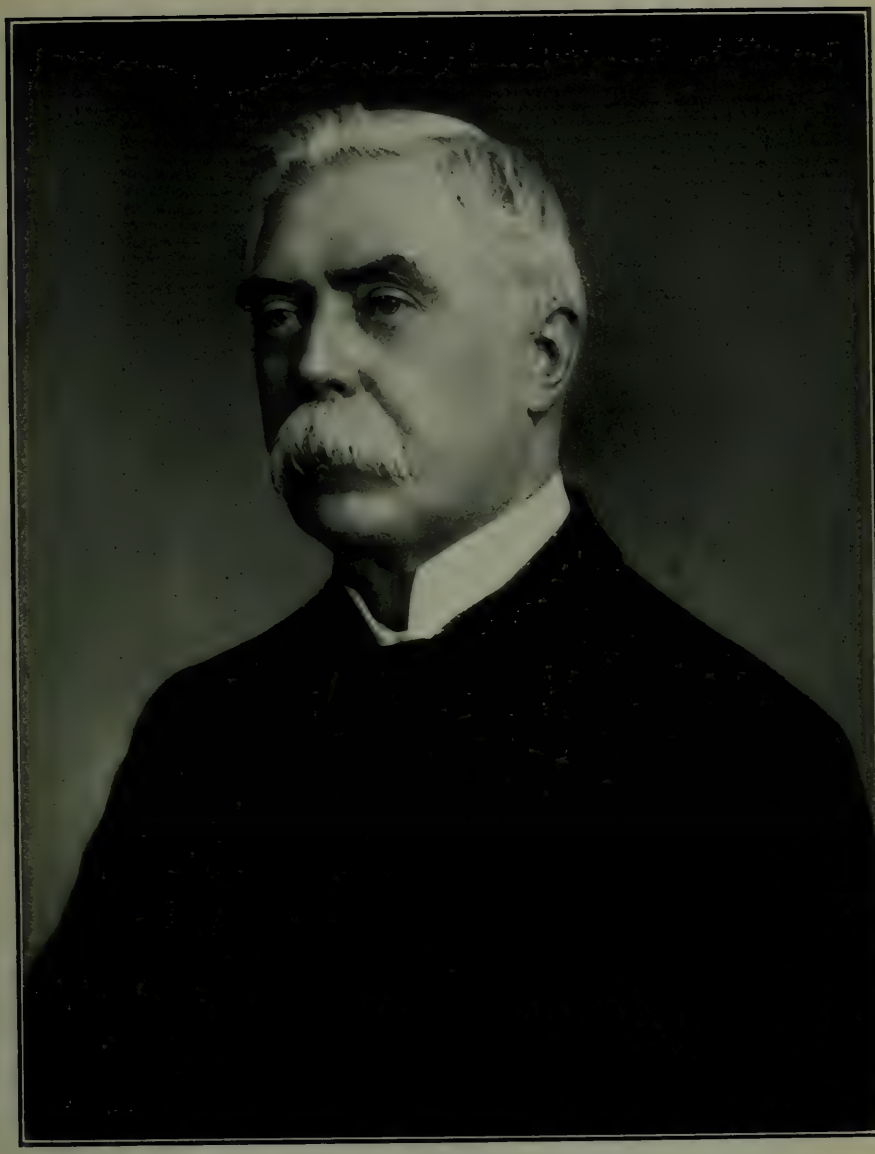
Afternoon, 2 o'clock.

Report of Committee on Land Surveying. J. McC. Watson, Chairman.
Paper.—"City Surveying." T. B. Speight.
Paper.—"Town Planning." W. J. Moore.
Paper.—"Re-marking of Governing Lines by the Government." C. F. Aylsworth.
Report of Auditors. J. H. Burd, & N. A. Burwash.

Thursday, 29th February—Morning, 10 o'clock.

IN THE ENGINEERS' CLUB.

Report of Committee on Entertainment. A. T. Ward, Chairman.
Nomination of Officers:—President, Vice-President, Secretary-Treasurer, two Members of Council, Auditors.
Unfinished Business.
New Business.
Adjournment.



Captain Killaly Gamble, R.A.

OBITUARY

CAPTAIN KILLALY GAMBLE, R. A.

Born near Enniskillen, Ireland, on the 18th October, 1844, Captain Gamble, late Secretary of the Association of Ontario Land Surveyors, died at Bournemouth, England, where he was visiting relatives, on 17th June, 1912. He was educated at Portora School and entered as a cadet at Woolwich where he took a high stand, and although the profession of civil engineering seemed to be almost hereditary in his ancestry, at least four generations having given eminent representatives to that calling, the late Killaly Gamble, selected military work, and but for a change in the regulations during his course at Woolwich his lot would have been with the Engineering Branch of the service. After being posted to the Royal Artillery he served in various parts of the Empire, and at one time was charged with making a report upon the defence of the Northern part of Ireland. Years later the chief points of the scheme designed by him were adopted by other experts and acted upon. After 16 years of service in the Royal Artillery at Dublin, Malta, Gibraltar, Halifax, Bermuda and other British Stations, he retired and came to Canada in 1882. He then entered the profession of land surveying at Winnipeg, and later having taken out commissions as Dominion and Provincial Land Surveyor became established in Toronto in 1886 with the firm of Messrs. Speight and van Nostrand. In the latter year he married Miss M. d'A Killaly, youngest daughter of the late Hon. H. H. Killaly, who predeceased him two years. The late Sir David Gamble of St. Helens, was a cousin of the deceased and between the two a firm friendship existed. For the past ten years Captain Gamble has discharged the duties of Secretary-Treasurer of the Association of Ontario Land Surveyors, and they will greatly miss this painstaking official. As was natural from his long connection with the Association, he won many close friends and his familiar face and cheery smile at our annual

gatherings will long be remembered. In Engineering circles also he was well known, having served the Engineers' Club of Toronto as its President in the year 1904, and again on the Club assuming greater responsibilities and extending into the large social organizataion it has become, he was the choice of its members as their President in 1911. His modesty, generosity, and genial manners fitted him for the positions he has filled, and endeared him to those with whom he came in contact. Dying without issue the last of the family of eight, none of whom left descendants, Captain Gamble's branch of that family passes from the scene, but his memory will ever remain fresh in the minds of all who knew him.

Minutes of the Twentieth Annual Meeting

— OF THE —

Association of Ontario Land Surveyors

HELD AT THE ENGINEERS' CLUB, 96 KING ST. WEST, ON THE 27th 28th and 29th, February, 1912.

The following members were present:

Abrey, George Spencer.
Ardagh, Arthur Gowan.
Aylsworth, Charles Fraser.
Baird, Alexander.
Barrow, Ernest George.
Beatty, David.
Beatty, Herbert John.
Bell, James Anthony.
Bolton, Ellsworth Doan.
Bowman, Clemens Dersteine.
Bowman, Herbert Joseph.
Brown, John Alexander.
Burwash, Nathaniel Alfred.
Chasé, Albert Victor.
Chipman, Willis.
Code, Richard Stanley.
Dalton, John Joseph.
Dempster, Herbert Orville.
Dobie, James Samuel.
Esten, Henry Lionel.
Fitton, Charles Edward.
Fitzgerald, James William.
Fullerton, Charles Herbert.
Gamble, Killaly.
Gibson, Peter Silas.
Gibson, Wilbert Silas.
Grant, Russell Reeve.
Hutcheon, James.
Jackson, John Edwin.
James, Darrell Denman.
Jupp, Albert Ernest.
Kirkpatrick, George Brownly.
McCubbin, George Albert.
McEvoy, Henry Robinson.
Morris, James Lewis.
Murphy, Charles Joseph.
Pequegnat, Marcel.
Phillips, Henry Percy Argall.
Pierce, John Wesley.
Roger, John.
Rorke, Louis Valentine.
Ross, George.
Rutherford, T. N.
Sewell, Henry DeQuincy.
Smith, George.
Snow, Ernest Arthur.
Speight, Thomas Bailey.
Stull, William Walter.
Tate, Harry William.
Ure, Frederick John.
van Nostrand, Arthur J.
van Nostrand, John.
Waddell, William Henry.
Ward, Archeson Thomas.
Watson, John McCormack.
Whitson, James Francis.
Wilkie, Edward Thomson.
Ducker, William A.
Miles, Charles Falconer.
Stewart, Louis Beaufort.

On Tuesday, February 27th, at 2.30 p.m., the President (Mr. J. F. Whitson) called the meeting to order and said: Gentlemen, The first thing on the programme is the President's address.

The President then read his address, which was received with applause.

The President—Next on the programme is the report of the Board of Examiners, but the Chairman of the Board is not with us yet and I will leave this over. I find there is no report on Legislation. Next comes the report of the Committee on Publication by the Secretary.

The Secretary then read the report of the Committee on Publication.

The President—Gentlemen, you have heard the report of the Chairman of the Committee on Publication. Do you wish that this report be adopted?

On motion of Mr. T. B. Speight, seconded by Mr. E. D. Bolton, the report was adopted and ordered to be published in the proceedings.

The President—Mr. Thomas Fawcett, the Chairman, is not here to read the report on Topographical Survey.

The Secretary—He has not yet sent his report, but he said he would send it.

The President—The next report is one by Mr. H. T. Routly, Chairman of the Committee on Exploration.

Mr. Routly—I am sorry, Mr. President, that my report is not yet ready. I have not been able to get a meeting of my Committee. I will try to have something to present before the close of the session. I hoped to have had a meeting of the Committee this morning, but the other members did not come in.

The President—The next is a paper by Mr. D. D. James on "Rights of Way." We will have to postpone this. This is all that is on the programme until the evening, but I think, Mr. Secretary, if there is any question any of the members wish to bring up we might have a short discussion on it.

There is a matter I myself would like to bring before you, in connection with the compiling of a town plan. It is a matter that was reported to me by Mr. McEvoy, of St. Marys.

Mr. Speight—If Mr. McEvoy would put the facts in writing we could place it before our solicitor, and if there is any action necessary it can be taken.

On motion of Mr. Speight, seconded by Mr. Bolton, it was decided to refer this matter to the solicitor for his opinion on receiving Mr. McEvoy's statement.

The President—The Chairman of the Committee on Legislation, Mr. Kirkpatrick, is now here.

Mr. Kirkpatrick—I haven't any report of the Committee on Legislation this year. There was really nothing done. According to last year's proceedings I see we were to get a copy of the revised

statutes with reference to surveyors in Ontario. I am informed from the gentlemen here that it has been printed. It comprises a copy of the Act with extracts from the Mining Act, the Land Titles Act, Registry Act, Ditches and Watercourses Act, and every Act that will assist a surveyor in his work. We ought to be very grateful to our Government for printing it at their expense.

The President—Have you the report of the Board of Examiners?

Mr. Kirkpatrick—Yes. (Reads same).

The President—You have heard the report of the Chairman of the Board of Examiners. Is it your pleasure that the report be received?

On motion of Mr. Watson, seconded by Mr. Code, the report of the Board of Examiners was adopted and ordered to be printed in the proceedings.

The President—Mr. James is not here yet to read his paper, and it is not certain when he will be here. I think it would be advisable to have him read his paper in the evening. There will be lots of time, and therefore I will adjourn this meeting to 8 o'clock this evening.

EVENING SESSION, 8 P.M.

Mr. J. F. Whitson, President, in the chair.

The President—The first item on the programme is a paper by Mr. D. D. James on "Rights of Way." I will now call on Mr. James to read his paper.

Mr. James reads his paper.

The next paper on the programme is one by Dr. Miller on "Canada's Mineral Wealth; I am sure it will be a very valuable paper. I will now call on Dr. Miller.

Dr. Miller reads his paper.

The President—The next item on the programme is "A Trip to Hudson Bay in 1900," by Mr. L. V. Rorke.

Mr. Rorke reads his paper.

The President—We will now have the report of the Committee on Polar Research presented by Mr. Chipman.

Mr. Chipman—I have not been able as yet to get my committee together, and I would prefer to ask that it be taken as read.

The President—Is it your pleasure, gentlemen, that this report be taken as read.

Mr. Chipman—The object of this is to save valuable time; the report is merely a resume of what has been done during the past year; there is nothing very startling.

The President—Then this is agreed to. The next is the report of the Committee on Repository and Biography, by Mr. Esten, but I do not see him here to-night. This meeting will now adjourn till to-morrow at ten o'clock.

MORNING SESSION, WEDNESDAY, FEBRUARY 28TH, 1912.

At 10 o'clock a.m. the President called the meeting to order and called upon Mr. George Ross to read the report of the Committee on Drainage.

Mr. George Ross then presented and read the report of the Committee on Drainage.

The President—I think you will all agree with me that this contains very valuable matter for our report; it is one of the most valuable on the Drainage Act that I think we have had for some years. I would like to know if any gentleman has any questions to ask or any remarks to make in connection with it? Is it your wish that this report be received and printed in our next annual report?

Mr. Fullerton—I have listened to the report with great pleasure. I had some ten years practice in drainage work and I can appreciate the difficulties one has in calculating the sizes of drains necessary to carry off the water from the water shed, and I would move that this report be received and printed in the proceedings.

Mr. Ure—Mr. Chairman, I have very much pleasure in seconding that motion. There is one thing, and it is a very important matter, especially when you get into tile draining, and that is the draining of main watercourses. I have been practising

drainage for about 30 years and the main part of my work now is and has been filling in open ditches that have been constructed years ago and putting in large tiles, and the run off in a certain area is a very important factor, and there is very little information available. If the Drainage Committee of this Association would get together and collect data from which they could found tables of run off, it would be doing a very great service to the Province and the engineers. When you are working with open ditches it is not such a serious matter because if you don't get it large enough the first time it is only a matter of eight or ten years before it has to be cleaned out and can be enlarged. But when it comes to the construction of covered drains it is very important that you should have the right size at first, and it is also important it should not be extravagantly large, for in that case you kill a good many drainage schemes that would otherwise go through. I don't know how Mr. Ross gets at the amount of run off. I have looked over Mr. McConnell's tables and I think they are altogether extravagant, and if I were to work according to Mr. McConnell's tables I think at least 50 per cent. of the work I now put through would not go through at all. I think they are unnecessarily large. It would be a great help to engineers, particularly young engineers without much experience, if data could be collected by the drainage committee. Mr. Ross' paper contains a good deal of very useful information. I don't know whether it is practicable for the Committee to get further information along those lines or not.

Mr. C. D. Bowman—Mr. President and Gentlemen, we have certainly all enjoyed Mr. Ross' report. I have often been up against that same proposition of the size of tiles for different purposes and I find that Hodgman's Book of Tables has helped me immensely, I think those tables are fairly reliable.

On motion of Mr. Fullerton, seconded by Mr. D. Beatty, the report was adopted and ordered to be printed in the annual report.

The President—The next item on our programme is the report of the Committee on Engineering by Mr. Hutcheon. I don't think he is here yet. However, I have here a paper by Mr. C. C. James, Deputy Minister of Agriculture. Mr. James unfortunately cannot be here to read this paper, so I will ask Mr. Speight to read it. It is entitled "A Mountain Railway in Norway."

Mr. Speight then read Mr. James' paper.

The President—I see Mr. Hutcheon is here We have been looking for you for some time, and we wish for the report of the Committee on Engineering.

Mr. Hutcheon—I haven't the report ready. However, I can give you the short paper I promised. This is perhaps rather an uninteresting subject after the paper we have had last evening and this morning.

Mr. Hutcheon then read his paper entitled "Coal Tar for Roads" which was received with applause.

The President—The next item on the programme is a paper by Mr. James White, Secretary of the Conservation Commission, on "Conservation in Canada," but we have not received it yet.

We should have a paper here by Mr. R. W. DeMorest on "Underground Surveys." His partner, Mr. Stull is here.

Mr. Stull—DeMorest has been detained; for the last three or four weeks he has been up on a survey during which he hadn't a chance to write his paper and is sorry. It was not to have been on "Underground Surveys" but rather on the Magnetometer surveys.

The President—I think there was some slight mistake as to time.

Mr. Stull—He thinks the paper will be more valuable if it were held over for another session, as he is working on surveys along that line at present and expects to get much more information than we have at present.

The President—Would it be possible for him to have the paper so that we could print it in our annual report?

Mr. Stull—I think possibly he can have it arranged so that you can have it in the report. What time of the year do you publish the report?

The President—It is published in about a month or so from now.

On a motion of Mr. van Nostrand, seconded by Mr. Hutcheon, Mr. DeMorest's paper was taken as read and ordered to be printed in the proceedings when prepared by Mr. DeMorest.

The President—I will now give you my own paper.

The President—We will now call upon Mr. Watson to read you the report of the Committee on Land Surveying.

Mr. Watson presented and read the report of the Committee on Land Surveying.

The President—I have a paper here on Town Planning by Mr. W. J. Moore. I don't know whether our time will permit of our having it read to-night or not and I would suggest this paper be taken as read and printed in our proceedings.

On motion of Mr. Watson, seconded by Mr. Sewell, the paper was taken as read and ordered to be published in the proceedings.

The President—The next paper on the programme is one by Mr. Speight on "City Surveying."

Mr. Speight then presented his paper on "City Surveying."

The President read the Auditor's report.

On motion of Mr. Fitzgerald, seconded by Mr. Sewell, the Auditor's report was adopted.

Mr. W. J. Moore's paper "Town Planning" was taken as read.

The President—I will now call upon Mr. Aylsworth to read his paper on "Re-Staking of Government Boundaries."

Mr. Aylsworth then read his paper which was received with applause.

At 4.30 p.m. the meeting adjourned.

THURSDAY, FEBRUARY 29TH, 10 A.M.

The President, Mr. J. F. Whitson in the chair.

The report of the Committee on Exploration was read, and its adoption moved by Mr. Routly, seconded by Mr. Speight and carried.

Mr. Dobie—I endeavored to get the information from the Algoma Central Railway; they ran a trial line from Hearst to Port Nelson; they started at Hearst, I do not know when they ran the lines, but Mr. McCormack promised to let me have the reports of their engineers.

The President—I would be glad if you can get that information.

Mr. Dobie—If we can get it, it might be embodied in the report. And in view of the fact that there is so much information in the hands of the railways, I would like to read a letter which I have received from the Canadian Northern. (Reads letter from Mr. Wilson.)

The President—Will you add this to your report?

Mr. Routly—Yes.

The President—Do you mean to say that that river has a double outlet?

Mr. Dobie—I remember Mr. Baird of Leamington went out by Grasett and he was instructed to investigate and follow the courses of these rivers, and he found a similar case, and I think there is another case exactly the same of a river dividing itself in two directions.

The President—I do not think we disposed of Mr. Watson's report on Land Surveying.

Mr. Watson—The question drawer was not taken up.

(Mr. Watson conducts question drawer, and refers to diagrams on blackboard.)

The Convention then adjourned till 2.30 p.m.

FEBRUARY 29TH, 1912. 2.30 p.m.

Mr. Whitson took the Chair.

The President—If any gentleman has not received a copy of the Act if they will kindly notify the Department we will be glad to send one to them. They are supposed to have been sent to all but I have learned of two who have not received theirs.

Mr. Ward said, as the time is so short the Entertainment Committee have not yet got up a report; it will be written before publication and handed in. I move the adoption of the report and that it be published in the proceedings.

This motion was seconded by Mr. Bolton and carried.

Mr. Watson—I would move that the sum of $400 be granted to the Secretary in recognition of his services during the past year.

Mr. Fullerton—I would second that; I know he has to do a good deal of work, and I also know that he has to pay out a good deal of money that he cannot very well put in the balance sheet. I think that $400 is a minimum. I second Mr. Watson's motion.

Mr. Routly—I would like to suggest that as soon as the Council name the various Committees that the Secretary be instructed to notify each individual member by letter of the Committee to which he has been appointed so that we won't have to wait until the minutes are issued. Sometimes they get lost in the mail; I did not get mine, neither did Mr. Somers and others have told me the same thing. I would therefore suggest that it be a rule that any of us who are appointed on committees be notified of that fact by the Secretary by letter.

Mr. van Nostrand—I would like to explain that that has been the invariable custom during the past years to notify the Chairman. Unfortunately last year, the Secretary was out of the country, and he left his business in the hands of a locum tenens, who failed in that particular. That is altogether impersonal.

Moved by Mr. R. S. Code, seconded by Mr. J. S. Dobie, that the sum of Five dollars be granted to each of the auditors for their services during this meeting. Carried.

Mr. van Nostrand—I would move, seconded by Mr. Sewell, that this Association has learned with deep regret of the death of the following members during the past year:

Alexander Niven, Toronto.

Roderick McLennan, Toronto.

Thomas Scane, Ridgetown.

Charles F. Aylsworth, Madoc.

Alfred J. Cameron, Peterborough.

David L. Steele, Meaford. Carried.

Moved by Mr. Code, seconded by Mr. Stull, that the Council of management be requested to make provision to take cognisance of all bills brought before the Provincial Legislature that affect the practice of our members, and that the Secretary be required to notify all members of such legislation when passed and assented to. Carried.

Mr. van Nostrand—The object is to avoid bills being rushed through that otherwise might have been stopped, and secondly, that when the legislation has been passed the information go out at once to the members.

Mr. Dobie—I would like to move that steps be taken to express to the Engineers' Club our thanks and appreciation of their courtesy to us in allowing us the use of this building. We have no permanent home of our own and I am sure the members appreciate the advantages and privileges of the club during this meeting.

Mr. Fullerton—I have much pleasure in seconding that. Carried.

The Convention adjourned for five minutes.

ELECTION OF OFFICERS.

On resuming.

The President—The first nomination is for the office of President.

Mr. Stull nominated Mr. T. B. Speight.

The President—There being no other nominations I declare Mr. Speight elected.

Mr. Speight—Gentlemen, I thank you for the honour you have done me and I feel it is an honour, I am sure you could have appointed many a one more worthy of it than I am. I will strive to fill the position to the best of my ability.

Mr. van Nostrand—I suggest while you are making up your minds that the policy laid down in the beginning was that the offices of president and vice-president, which are largely honorary be so arranged that they may be held by members remote from Toronto; for this reason a chairman of the Council was arranged for, and he is the permanent executive head for all the detail work of the Association. The President and vice-President are members of the Council and attend the meetings that are called and take charge of the annual meeting; Toronto has already had two presidents in succession and it is for the remote members to assert their rights in the naming of their vice-President.

Mr. Fullerton—I nominate Mr. Dobie for vice-President.

Mr. Routly—I have much pleasure in seconding that nomination.

The President—As Mr. Dobie is the only nominee I declare him to be elected vice-President.

Mr. Dobie—I assure that this is an honour that is entirely unexpected, I had no idea that I would be chosen; I appreciate it very highly and will do all I can do to further the interests of the Association during the coming year.

Mr. Ward—I will nominate Captain Gamble to fill the office of secretary-treasurer, seeing he has done it so well in the past.

Mr. Code—I have much pleasure in seconding that motion.

The President—There is no other name before us and I declare Captain Gamble elected to the office of secretary-treasurer.

Capt. Gamble—I thank you very much for the honour you have done me. I feel my poor efforts are of no avail unless I am supported as I always have been by the officers and members of the Association. I have always had the interests of the Association at heart and will try to do all that I can for their advancement.

The President—Now we have to elect two members of the Council. The present retiring members are Mr. H. J. Beatty, and Mr. James Hutcheon; Mr. Hutcheon took the place of the late Mr. Niven. We have always had a contest for these positions and we consider it very desirable that it should be so; it assists us greatly in getting in the fees, for the simple reason that you cannot vote unless you have paid your fees; I hope that there will be a keen contest on this occasion.

The following nominations were then received:

Mr. E. D. Bolton, by Mr. Fullerton.

Mr. H. J. Beatty, by Mr. Watson.

Mr. Aylsworth, by Mr. Ward.

Mr. Stull, by Mr. Dobie.

Mr. Hutcheon, by Mr. van Nostrand.

Mr. Routly, by Mr. Speight.

Mr. Routly—You have got five nominations and there are only two to be chosen. I think you should not allow my name to go in.

The President—Who else is there from the north?

Mr. Routly—Mr. Dobie.

The President—He is away west; that is in a different section; I think you should allow your name to stand. There being no further nomination I declare the nominations closed. The next nomination is that of auditors, two auditors.

The Secretary—Mr. Burwash and Mr. Fitzgerald were the auditors this year.

Mr. van Nostrand—I move that the auditors for the coming year be Mr. Fitzgerald and Mr. R. R. Grant.

The President—There being no further nominations I declare these two gentlemen elected.

I appoint Mr. Ward and Mr. Esten to act as scrutineers on the vote for the members of the Council.

Mr. Speight took the chair.

Mr. Fullerton—It is fitting that this Association should move a vote of thanks to the retiring President for the way in which he has conducted the affairs of the Association during the past year. We know that he has been very capable, and we have seldom had a President who has been able to induce the Minister of Lands, Forests and Mines to come to our annual banquet.

The Chairman—It is moved by Mr. Fullerton, and seconded by Mr. Bolton that a vote of thanks be tendered to Mr. J. F. Whitson who so worthily represented the Association during the past year.

This motion was carried amid applause.

The Chairman—I have very great pleasure in conveying to you, Mr. Whitson, the thanks of this meeting for the very able manner in which you have presided over the affairs of the Association during the past year.

Mr. Whitson—I thank you for your kindness; I have tried to do my best, only I feel that I have come very far short of what I hoped to do. Thanks to you, my term of office as President has been a very pleasant one, in fact it has been one of the proudest and happiest years of my life.

The Secretary—The President has asked me to explain to you with regard to the Cameron fund. Mrs. Cameron was left by her husband's death with seven young children almost unprovided for; an appeal was made at the time and we sent out circulars just stating the case and asking any who cared to do so to help. The call has been warmly responded to, and I have received $368. for Mrs. Cameron and her children.

Mr. van Nostrand—And the list is still open.

Mr. Whitson resumes the chair.

The President—You have heard what the Secretary has said in this matter; I think we should consider carefully; it is a case which is deserving of every consideration; while Mr. Cameron was not particularly well known to the members attending these Association meetings, I knew him during the first few years of his professional life and I can assure you that he was a very fine fellow. I think that anything that we can do for his widow will be greatly appreciated; it is a difficult matter to bring up a family of seven small children the eldest of which is only fourteen without some assistance. It has been suggested that we should endeavour to raise the fund to $500. as the Secretary says $368. has been already subscribed.

Mr. Routly—I would like to move that the Council be empowered to deal with this fund as they may see fit after investigating all the circumstances, as it stands now no one has any authority to do anything else but hand the money over in one lump sum, and it might not be advisable to do so, I would move that this matter be left in the hands of the Council.

Mr. van Nostrand—I would second that; it may be that a certain sum per month would be a better way to deal with it; that information can be obtained in Peterborough and the Council can dispose with it as they see fit. Carried.

Mr. Fullerton—There is one thing that I would like to mention before we leave and that is with regard to the publication of the annual report. In the annual reports of some institutions they give the names of the past Presidents from the time of the formation of the Association until the present, and I think it would be a nice thing to have in our report, so that at any time we can turn up the report and find out who was President for any year; it would not add to the expense for the information is all at hand in the Secretary's office.

Mr. van Nostrand—I have much pleasure in seconding that. During the tenure of office of our most energetic Secretary Mr. Chipman a general index was compiled of our reports and of the subjects treated in them up to the year 1896. I understand that our present Secretary has already done a great deal of work in compiling an index up to date and it is his intention to publish that index in the forthcoming report, which will make a fairly large report but it will render all our back reports the more valuable.

The President—Will you have that index printed separately? I think if you are getting out a list of surveyors it might be well to have it printed with that and bound together.

Mr. van Nostrand—That might perhaps be left to the discretion of the Secretary; we do not want a report that is two-thirds index and a separate index might perhaps be the better way to arrange it, but I think that better be left to the Secretary.

The President—I do not know that I am in order in making a suggestion along another line of work, I would suggest that the surveyors should furnish the Association with the magnetic declination of the locality in which they are practising; The Department at Ottawa are gathering statistics along this line, and it is a very difficult matter to get this information unless it comes from the surveyors in the district.

Mr. Aylsworth—In the northwest every surveyor is instructed to take as many as he can get during the summer.

With regard to the index I think it would be a good idea and I would suggest that you classify the information under such heads as "roads and bridges surveying," "ditches and watercourses," "municipal," or under any other head that may be necessary.

The President—I suppose that is what would naturally be done.

Mr. Aylsworth—Are there any old copies of the reports available?

Mr. van Nostrand—Of certain years there are plenty but others are out of print. The year 1890 has been out of print for many years.

The President—They are for sale at 50 cents each.

Mr. Stull—Mr. Whitson's idea for taking the variation of the compass is a good idea for some sections but in our district we cannot depend upon the magnetic needle except at the place where the magnetic reading is taken. To give you an instance of what I mean; in some places where you set up you will find that the needle will vary in a fairly constant manner, but if you happen to pass a boulder of diabase you will find your needle vary from 30 minutes to a degree.

The President—I refer mainly to the older sections of Ontario, where we have no record in the Department, or anywhere else, of what the magnetic variation is.

Mr. Stull—If you fail to get a large number of readings from us at Sudbury you won't feel hurt about it. We find very often that after you set your instrument in the same place a second time that you do not get the same reading as you did at first; in fact, if you set your instrument higher or lower you get a different reading; the only way would be to have a compensating magnet whereby you could get the horizontal intensity at that particular point.

Mr. Chipman—I think the attention of the Committee on Biography should be called to the fact that there are a number of omissions in the lists of deceased members; I do not see any reason why that cannot be made complete; take the death of Walter Beatty, he only died in 1911 and yet the date is blank; I think it would only require a little attention to fill these blanks up.

Mr. van Nostrand—Don't you think that that had better be done by the Secretary; the Committee on Biography does not exercise any jurisdiction over that list.

Take the case of Thomas Scane, no one knows anything about that here; if surveyors would only keep that in mind and send a notice to the Secretary it would help him very much. For years I have been taking clippings out of the newspapers and making notes of these dates, and if others would do the same we would have these records more or less complete, but it is almost impossible unless that is done by some one. I know the difficulty in getting information of this kind; it is impossible for one man to get it all; perhaps some of it could be got by communicating with a surveyor in the vicinity of where the deceased surveyor practised. We all knew William Spry a very prominent engineer who died here in Toronto and the date of his death is not given.

Mr. Stull—Would it not be wise to have a better binding on your reports and charge the amount necessary for that, so that any person wishing to receive a bound copy of the proceedings for the year could have it at the nominal sum of whatever it would cost.

The President—I do not think that would be a good idea; we usually get three or four numbers, and they can all be bound together.

Mr. Stull—The ordinary unbound volumes would be received by any person unless they paid for the extra binding.

The Secretary—I think most of us bind three or four years together.

The President—I do not think binding would find favor with the profession generally.

Convention adjourned.

PRESIDENT'S ADDRESS

To the Members of the Association of Ontario Land Surveyors :

Gentlemen :—

We have now opened our Twentieth Annual Meeting and on behalf of the Association of Ontario Land Surveyors, I extend to you the welcome hand. We are here once more for the laudable purpose of promoting the best interests and the advancement of our profession and I sincerely hope that you will find this meeting, as all previous meetings, both pleasant and instructive. Much effort has been made by our worthy Secretary to secure a number and variety of papers from our Members and from others prominent in kindred professions. Our own Members have not responded as I had hoped.

I take this opportunity on behalf of the Association of heartily thanking those members who for many years past have been unsparing in their efforts to advance the Association's interests and of specially thanking those who are not members for the valuable contributions they have given us and personally I wish to thank you for the honor you have done me in placing me in the chair.

I am not to-day going to burden you with any lengthy remarks but will briefly outline a few subjects which I hope we may find time to consider during our short session.

You will all concur with me in expressing deep regret in the loss of three of our members by death, since we last met. The death of Mr. A. J. Cameron and that of Mr. D. L. Steele occurred under exceptionally sad circumstances. That of Mr. Alexander Niven was chronicled in our last report. By his

death we have lost one of our most honorable and foremost surveyors. The present generation of surveyors need no eulogy of him and for posterity it may be simply stated that they will know him by his good works, which will remain as permanent monuments long after New Ontario has extended its flourishing settlements beyond the Transcontinental Railway.

The terrible loss of life last July by the forest fires in the vicinity of Porcupine and Cochrane, we all deplore and to the relatives and friends of those who perished we extend our sincere sympathy.

The past year has been a very busy one for surveyors in local, mining and Governmen surveys, the Provincial Government having last year expended the largest amount on Surveys for one year since Confederation.

It is with a sense of gratification that I am in a position to state that the success of the Association during the year just past has been as great as ever before. Our financial condition is fair and no obligations have been incurred that we have not been fully able to discharge. In this respect we are in a position to congratulate each other and in our prospects for the future.

It must be gratifying to the members of the profession to read, from time to time, the reports of the different surveyors who have for the past ten years been engaged on survey in the clay belt. These reports all tend to convince us beyond any question of doubt that in that section of New Ontario we have a very large area of fine agricultural land, almost as great as the settled portions of Old Ontario, now ready for the settler owing to the completion of the Temiskaming & Northern Ontario and the National Transcontinental Railways. New sections are still being opened up by the construction of the Canadian Northern from Sudbury to Port Arthur and the extension of the Algoma Central Railway from Sault Ste. Marie to the town of Hearst on the Trans-

continental. In less than one year we will have the Transcontinental Railway running through an almost unbroken stretch of fine agricultural land for nearly 400 miles, with good land extending in most places from 25 to 50 miles on each side. The extension of the Algoma Central to a junction with the Transcontinental will pass through, at least, 50 miles of rich agricultural land and the Canadian Northern will traverse a very large area of similar land. Already the Government has surveyed into lots and has now ready for settlement 108 townships, covering an area of three million acres, along the Temiskaming & Northern Ontario Railway and the Transcontinental Railway, in the clay belt. I merely mention this as an encouragement for our younger members. The Government has, as yet, opened for settlement few of these townships as it was not considered advisable to locate settlers in a wooded country in advance of either colonization roads or railways as many owing to the inaccessibility and want of roads would leave the country and seek more favorable conditions where the soil was less productive.

It is no flight of imagination to picture in the next 20 years flourishing settlements for 500 miles on both sides of these different railways through the clay belt. By the construction of trunk roads along these lines of Railway the condition of the settlers will be much more favorable than those of Old Ontario 40 years after the first settlers located. If we could succeed in inducing a few pulp mills to commence operations in the clay belt so as to give the settlers a market for the spruce on their lots instead of having to burn it we would soon settle up New Ontario.

One of the subjects which I hope will be discussed at this meeting, while we have with us several of the surveyors who have been engaged in survey work in the clay belt, is the agricultural prospects of that district as observed by these men while on these different surveys, with a view to collecting reliable information respecting climatic conditions, summer frosts, etc., etc.

There is one more subject I would ask you to devote some time to and that is where a surveyor is called upon by a private individual to make a survey of a mining claim, the boundaries of which are in dispute, what information should he deem it his duty to supply the mining recorder or show on his plan and field notes.

In conclusion, let me express hearty thanks to the Association for the kindness you have shown me and regret that circumstances did not permit my giving you better service.

REPORTS.

SECRETARY-TREASURER'S REPORT.

Mr. Chairman,—I have the honor to lay before you the report of the official business of the Association transacted by me between the 25th February, 1911, and the 26th February, 1912. The "Papers" that had been read and the minutes of our Annual Meeting were revised and prepared for publication as early as possible.

We sent copies of our Reports to the following societies:

School of Practical Science, Engineering Society....	200 copies
Michigan Engineering Society.....	200 copies
Illinois Society, Engineers and Surveyors.....	180 copies
Indiana Engineers' Society.....	120 copies
Iowa Civil Engineers' and Surveyors' Society.....	120 copies

And copies of the Reports we received from them were as far as possible distributed among the members who were not in arrears with the Association.

In acordance with the instructions of the Council, I procured an office for the Association in the Temple Building, at a monthly rent of $15. I removed all the properties of the Association from the Parliament Buildings to the new office which has been furnished in a manner to meet our requirements. We hope the Department of Repository and Biography will soon get busy in our new quarters.

During the year, eighteen new members were received into the Association, and we have to regret the loss by death of the following: Messrs. A. Niven, A. J. Cameron, D. L. Steele.

Our thanks are due to the various departments through whom we have regularly received the Annual Reports of the United States Coast and Geodetic Survey, the Geological Survey of Can-

ada, the Dominion Archives, and the Ontario Reports of the Bureau of Mines, and the Bureaus of Industry and Forestry.

The financial statement acompanying this report shows the favorable condition of our affairs.

In conclusion, I wish to return my hearty thanks to the officers and other members of this Asociation for their unvarying kindness toward me, and for the assistance they have given me in the discharge of my duties.

Respectfully submited,

KILLALY GAMBLE,

Secretary-Treasurer.

STATEMENT OF BALANCES, RECEIPTS AND EXPENDITURES BETWEEN 25TH FEBRUARY, 1911, AND 24TH FEBRUARY, 1912.

Dr.

To Balance in Savings Account 25th February, 1911.	$2,163 35
To Balance in Current Account 25th February, 1911.	1,803 70
Receipts in Board of Examiners Account, including Government grant of $200 and regular fees....	1,231 00
Annual fees including Associate fees.....	651 00
Amount collected from Advertisements.....	170 50
Accrued interest on Savings Account.....	65 35
	$6,084 90

Cr.

By Amount granted Auditors.....	$ 10 00
By Amount granted to Secretary-Treasurer.....	350 00
By Amount Stenographer for reporting Annual Meeting.....	50 00
By Amount Premium on Secretary's Bond.....	7 50
By Amount Lantern, for Lecture.....	6 00
By Amount paid for Postage and Express.....	107 00
By Amount for publishing Proceedings.....	393 30
By Amount Herbert Beatty Council Meeting 18th April.....	17 00
By Amount C. H. Fullerton, Council Meeting 18th April.....	19 20
By Amount J. M. Watson, Council Meeting 18th April	6 60
By Amount Marking Standard tapes.....	21 00
By Amount for printing List of Members.....	10 00
By Amount Freight, cartage, brokerage and sundries..	18 56
By Amount Flowers for Mr. Niven's funeral.....	12 00
By Amount paid canvasser for advertisements.....	57 80
By Amount Rent of lecture room, Engineers' Club, (Annual Meeting).....	20 00
By Amount paid for printing and stationery.....	78 60
By Amount rent of offices.....	90 00
By Amount Armour & Mickle, Solicitors.....	10 00
By Amount New Register.....	31 31
By Amount paid for engrossing names on New Register	10 00
By Amount paid for arranging and furnishing new office.....	229 27
By Amount paid for rent of tables for examinations.	35 00
	$1,590 14

By Amount Accounts	$1,590 14
By Amount of disbursements in Board of Examiners Act	691 00
By Balance in Savings Account	2,228 70
By Balance in Current Account	1,656 22
	$6,166 06
Cash in hand	8 84
	$6,174 90
Cheques outstanding	90 00
	$6,084 90

Respectfully submitted,

KILLALY GAMBLE,

Secretary-Treasurer.

AUDITOR'S REPORT.

We hereby certify that we have examined the Secretary-Treasurer's vouchers, receipts, final statement and bank accounts and find them correct, except for an entry for duplicating examination papers omitted. This is the Secretary's loss but will be credited to him in next statement.

J. W. FITZGERALD,

N. A. BURWASH,

Auditors.

REPORT OF THE COUNCIL OF MANAGEMENT.

The Council begs to report to the Association of Ontario Land Surveyors that it has eld two meetings since the last meeting of the Association, one on the 18th April, 1911, and the other on the 27th February, 1912. At the meeting of the 18th April, Mr. George B. Kirkpatrick was appointed Chairman for the ensuing year.

The names of the members of the Standing and Special Committees were approved, the Chairman of each being as follows:

Land Surveying—C. J. Murphy.
Drainage—George Ross.
Engineering—Owen McKay.
Topographical—Thomas Fawcett.
Entertainment—A. J. Ward.
Publication—Killaly Gamble.

The Chairmen of the Special Committees were as follows:

Legislation—G. B. Kirkpatrick.
Repository and Biography—L. V. Rorke.
Exploration—J. F. Whitson.
Polar Research—Willis Chipman.

G. B. Kirkpatrick and Owen McKay were reappointed Members of the Board of Examiners by His Honor the Lieutenant Governor in Council upon the recommendation of the Honorable the Minister of Lands, Forests and Mines for a period of three years, Order in Council dated 4th April, 1911.

The Secretary was authorized to secure suitable rooms for a Repository in the Temple Building, Bay Street, at a rental not exceeding $20 a month for the use of the Association.

The Council authorized the printing in paper binding one thousand copies (1000) of the Revised Survey Act, Ditches and Water Courses Act, Ontario Drainage Act, Special Acts relating to Survey of Lands and such parts of the Registry Act, Land Titles Act, Municipal Act, and Mining Act of Ontario, as relates to surveys.

The Council authorized the Secretary in conjunction with a Committee consisting of G. B. Kirkpatrick, P. S. Gibson and T. B. Speight to invest such funds of the Association now in the Savings Account in bonds or other approved securities. Following this out Stock in the Consumers' Gas Company of Toronto was purchased for two thousand dollars.

Owing to the lamented death of Mr. Alexander Niven, Mr. James F. Whitson was appointed member of the Board of Examiners for the unexpired term of Mr. Niven's appointment.

The Council has to report the loss of six members of the Association during the year

Alexander Niven, Toronto.
Roderick McLennan, Toronto.
Thomas Scane, Ridgetown.
Charles F. Aylsworth, Madoc.
Alfred J. Cameron, Peterboro.
David L. Steele, Meaford.

Respectfully submitted

GEORGE B. KIRKPATRICK.

Chairman of Council.

REPORT OF BOARD OF EXAMINERS.

The Board of Examiners met in the Board Room, Department of Lands, Forests and Mines, on Monday the 12th of February, 1912.

The following candidates passed their preliminary examination:

Ross O. Sturdy, Eglinton, Ont.
V. H. Ramsden, Toronto, Ont.
Charles J. Manser, Toronto, Ont.
N. J. Goebel, Berlin, Ont.
A. L. Nash, Toronto, Ont.

The following candidates passed the required final examination:

W. Lindsay Malcolm, Kingston, Ont.
F. V. Seibert, Southampton, Ont.
William Gourlay Webster, Brantford, Ont.

Wilmot Johnston Baird, Scarborough, Ont.
George Hogarth, Toronto, Ont.
James Martin McGregor, Chatham, Ont.
Oliver Roland Blandy, Hamilton, Ont.
Frederick Carleton Lane, Toronto, Ont.
Robert Murray Gourlay, Toronto, Ont.
Norval Clarence Lloyd, Toronto, Ont.
William Sinclair Earle, D.L.S., Picton, Ont.
W. A. Sibbett, Brantford, Ont.
N. M. Gibson, Willowdale, Ont.
J. C. Street, Toronto, Ont.

Their certificates to bear date 22nd February, 1912. Two or three of the above not being quite out of their apprenticeship, their certificates will bear date as soon as their articles expire.

The following bonds have been approved and filed with the Provincial Treasurer in accordance with the provisions of the Act respecting Land Surveyors, 1st George 5th, chapter 41, section 35:

Ira J. Steel.
Alec Roger.
John T. Ramson.
Calvin B. Allison.
Charles H. Attwood.
W. C. McGeorge.
Albert McMeekin.
Robert N. Slater.
John E. Jackson.
Russel R. Grant.
G. P. Angus.
R. W. Code.
James T. Coltham.
Harry W. Tate.
W. E. Taylor.
A. E. Jupp.
John A. Brown.
Alex S. Campbell.
R. M. Anderson.

The following articles were filed by the undernamed pupils during the year:

Name of Pupil	Name of Surveyor	Residence	Date of Articles	Terms
Smith, Oliver	Walter Smith	Lindsay	Feb 18, 1911	3 years
Marck, J. A	J. J. MacKay	Hamilton	March 1, 1911	3 years
Fletcher, W. J	J. J. Newman	Windsor	March 8, 1911	1 year
Mucklestone, F. H.	T. D. LeMay	Toronto	March 11, 1911	3 years
Gardiner, J. C	Norman Wilson	Toronto	March 25, 1911	1 year
Hill, Norman	I. J. Steele	Ottawa	March 29, 1911	1 year
Ross, C. M	T. J. Byrne	Ottawa	April 10, 1911	1 year
Leitch, J. N	C. H. Fullerton	New Liskeard	April 25, 1911	1 year
Flook, S. E	W. S. Gibson	Willowdale	April 29, 19 1	1 year
Kirkup, C. H.	E. R. Bingham	Fort William	April 30, 1911	3 years
Gibson, W. G	T. B. Speight	Toronto	July 10, 1911	1 year
Huether, A. D	R. McDowall	Wiarton	Aug. 1, 1911	1 year
Maisonville, A.W. R.	Speight & van Nostrand	Toronto	Oct. 14, 1911	1 year
Goad, V. A. E.	H. W. Tate	Toronto	Oct. 24, 1911	1 year
Sedgewick, A.	W. A. McLean	Toronto	Jan. 19, 1912	1 year
Cavell, E	W. H. Brown	Toronto	Feb 17, 1912	1 year

Respectfully submitted,

GEO B. KIRKPATRICK,

Chairman of Board.

REPORT OF COMMITTEE ON PUBLICATION.

Mr. President—After preparing the papers for publication and reviewing the minutes of the meeting as reported by our stenographer, and also having got ready the necessary diagrams for illustrating papers and reports, your Committee placed the publication of the Annual Report in the hands of the Business Printing Co., who carried it out very satisfactorily. 1350 copies were printed and distributed amongst the Societies who exchange reports with us, amongst the various scientific bodies and libraries we correspond with, and amongst our members. We have taken steps to increase our advertising and we have been fairly successful.

Respectfully submitted,

KILLALY GAMBLE,

Chairman.

REPORT OF COMMITTEE ON ENTERTAINMENT.

Mr. President,—Your Committee on Entertainment beg leave to report as follows :—

Arrangements were made with Mr. E. G. E. McConkey for the use of the Rose and Nile Rooms and the usual careful attention was given to our comfort. Seventy-one members and guests were present, the Chair being occupied by the President, Mr. J. F. Whitson, and the Vice-chair by the Vice-President, Mr. T. B. Speight.

Due appreciation having been shown to the creature comforts provided by the genial boniface, the following Toasts were given :

The King, proposed from the Chair.

The Empire and Canada, proposed by Mr. E. Stewart, and ably responded to by Hon. W. H. Hearst, Dr. W. H. Ellis, Dr. W. G. Miller, and Col. A. M. Hay.

Sister Societies, proposed by Mr. H. J. Bowman and responded to by Mr. W. Chipman, on behalf of the Engineers' Club, Prof. H. E. T. Haultain, on behalf of the Mining Institute, Mr. J. B. Tyrrell, on behalf of the Canadian Institute, and Mr. J. W. Seymour Corley, on behalf of the legal profession.

Our Guests, proposed by Mr. C. F. Aylsworth, and responded to by Mr. James Burrows, Dr. J. S. Bach, Mr. G. G. LeMesurier, Mr. R. F. Stupart and Mr. W. Ford Howland.

Chief among the volunteer toasts which followed was that of the Veterans, proposed by Mr. H. J. Bowman, and responded to by Mr. G. B. Kirkpatrick and Mr. Elihu Stewart.

Interspersed amongst the toasts were songs by Messrs. Boyd, Sewell, LeMay and others, with rousing choruses. Humorous addresses and recitations by Messrs. C. F. Aylsworth, J. S. Bach and Col. Hay, still further enlivened the proceedings.

Your Committe is again indebted to the Secretary for his generous contribution to cover the usual deficit, without in any way encroaching upon the general fund of the Association.

Respectfully submitted,

A. T. WARD,

Chairman of Entertainment Committee.

A QUESTION OF LATITUDE.

(Abridged from the ballad written by Col. A. M. HAY, of Toronto).

All successful navigators have been prevaricators,
Since the days of good old Noah and the Ark ;
Columbus told some tales, of sea serpents, whales and gales;
And Raleigh with the public had a lark.
While they sailed the summer seas, navigating at their ease,
With their topsails and their spinnakers unfurled,
They'd no trouble to keep warm, lots of time to spin the yarn
Which, later on, they reeled off to the world.

The Circumnavigator, sticking close to the equator,
Made slow progress, by degrees of longitude,
And, while sailing east or west, he always found it best
To borrow just a little latitude ;
He created quite a rumpus every time he boxed the compass,
But he ultimately got his work down fine ;
When the compass he could box he had solved the paradox
That a semi-circle's shorter than a line.

Difficulties of Arctic navigation rencounted. . . .our truthful explorer decides on Pole quest. . . .charters "combination" ship—"she could sail or fly with ease, climb mountains and scale trees" . . . . hires crew of two. . . . . weighs anchor. . . . voyages longly and northerly. . . .nearing the Pole, the Bos'n reports "no supplies," but, nothing daunted, our truth-cleaving sea-dog narrates how he "got there."

When I got the information, I made an observation,
While the Bos'n made a number of his own—
On the last part of the trip, I would make an Arctic dip
And travel underneath the iceberg zone.
So we opened the sea-cock, sank, like going down a lock.
"Full speed ahead !" and then I held my breath,
For if we slipped a cog, or struck a sunken log,
It was clearly just a case of instant death.

I made a calculation, that a little variation
South of north, would cut the distance just in two.
'Twould be easy to emerge, where lines of longitude converge,
If we steered north—astronomically true.
We knew we'd reach our goal when we bumped against the Pole;
Took a half-hitch—then we emptied out the tanks;
As we bobbed up from below, we could hear the breezes blow,
And on our knees we offered up our thanks.

On dewatering my eyes, lo! What was my surprise
To find the Pole was spinning like a Peary;
And there was Cook on top—no I never drink a drop,
But I must admit the Bos'n's eye is bleary;
There are no prevaricators amongst the Arctic Navigators;
I couldn't tell a lie to save my soul;
And I've solved the new equation of Arctic navigation:
There's no Latitude for Liars at the Pole.

REPORT OF THE COMMITTEE ON EXPLORATION.

Your Committee beg to report that work of a more or less exploratory nature has been carried on to a large extent during the year 1911. About 1070 miles of township outlines including 127 miles of base and meridian lines were surveyed during the past season. Traverse was also made of the Mattagami, Ground Hog and Kapuskasing Rivers by the Department.

In addition to this an exploration was sent out by the Temiskaming & Northern Ontario Railway. This party made an examination of the soil, timber and other resources along the Moose and Mattagami Rivers between the Transcontinental Railway and James Bay. Accurate stadia surveys with soundings were made of the estuaries of the Moose and Hurricanaw Rivers. The T. & N. O. Railway also ran a trial line between Gowganda and Porcupine taking note of the timber, mineral and agricultural resources.

The Algoma Central Railway completed their location between Sault Ste Marie and the Transcontinental Railway and sent parties from the town of Hearst (their junction point with the Transcontinental) to explore the country for further railway extensions to Port Nelson.

The C. P. R. completed their location between Fort William and Ottawa. Their chief engineer reports the finding of some very interesting features in connection with the watersheds of the various rivers crossed by their line which runs through the Clay Belt near the Height of Land.

Doubtless much other work of an exploratory nature has been carried on by other public or semi-public institutions which would be of very great value to the public at large if the information obtained were published in the form of reports and maps.

Your Committee begs to recommend as follows:

(1) That levels be taken along all new meridian, base and township boundary.

(2) That in view of the fact that large sums have been voted by the Government for the development of New Ontario this Association would recommend that a considerable portion of this money could be spent in no better way than by a thorough exploration of the various resources of the different sections of New Ontario. The country might be maped out in sections and these sec-

tions be explored and reported upon in detail in such order as might be deemed advisable by the authorities in charge of the expenditure of the grants.

(3) Your Committee would recommend that all railways receiving Provincial aid should be requested to furnish the Department with copies of their plans, profiles and reports of all trial and location lines run in New Ontario and that the Surveys Branch of the Department of Crown Lands be requested to undertake the compiling of more up to date detailed maps of the un-subdivided portions of New Ontario, procuring for this purpose all the information available.

H. T. ROUTLY,

Chairman.

REPORT OF COMMITTEE ON DRAINAGE.

Mr. President—Your Committee on Drainage for the year 1911 beg leave to report as follows:

The past season, owing to the fact that it was an unusually dry one, was very favorable to drainage operations, and coming as it did after a couple of wet seasons, gave an opportunity to complete a large amount of team and scraper work that had been left over from the previous year.

Your Committee was unable to secure information as to how drainage work was progressing in a great many portions of the Province, but as far as we are aware the volume of drainage work is increasing and the Drainage Acts are working with comparative smoothness.

Not having secured detailed information regarding drainage work or drainage cases that might be of value, your Committee will endeavor to give some practical information that may be of use to some of our young members, who may not have had an opportunity of obtaining much practical experience in drainage engineering.

Drainage reclamation work falls naturally under three different classifications.

1. Title drainage, or farm underdrainage.

2. Open ditches to drain swamps or marshes; the widening, deepening or straightening the channels of streams or rivers, or the construction of channels to relieve flooded areas.

3. Dyking or levee work.

Tile Drainage.

Underdrainage has been known and practised in Ontario to some extent from the pioneer days, when the materials used were stones and slabs. These materials in time gave place to tile. Although in later years a considerable amount of tile underdrains were laid, and usually with gratifying results, the practise of underdrainage spread with comparative slowness. In the past, tile drains were usually laid by a class of men called tilers, who usually worked by guess or got their grades with water in the trench.

Agricultural colleges have recently taken up this class of work, and since 1905 the Ontario Agricultural College of Guelph sends out each season a certain number of young men, who receive a special training in this subject, to make surveys and give demonstrations of the benefits to be derived from tile drainage.

These demonstrators have been doing a splendid work, and the demand for their services is increasing very rapidly each year.

The benefits of tile drainage are so many and so great that when they come to be fully recognized the surveyor will be called on much oftener than at present to lay out and take charge of large tile drainage schemes.

One of the most important points in a scheme of tile drainage is the outlet, but if natural outlets are not available these may be obtained by recourse to The Ditches and Watercourses Act or The Municipal Drainage Act.

The character of the soil is another very important point to be considered. After making a rough topographical survey, a suitable scheme may be designed, using a main or several mains on the fan-shaped or on the gridiron systems.

To obtain the sile of tie required, calculations should be based on the amount of water to be carried off in 24 hours—$\frac{1}{4}$ in. or $\frac{1}{2}$ in. or other quantity, varying according to the character of the soil, the amount of soakage to be taken care of, etc. One inch of rain per hour running off one acre of land will give 60.5 cubic feet per minute, or approximately one cubic foot per acre per second, and $\frac{1}{4}$ of an inch in 24 hours will give .63 cubic feet per minute per acre.

The amount of water that will flow through a pipe depends on three factors, the size, the slope or grade, and the "coefficient of roughness."

The following table, worked out by McConnell, may be used as a guide under ordinary circumstances to obtain the size of pipe required to drain a certain area, when laid at a certain grade.

TABLE OF SIZE OF TILE PIPE OF MAIN DRAIN (McCONNELL)

Fall	Acres Drained					
	3-in. tile.	4-in. tile.	6-in. tile.	8-in. tile.	10-inch tile.	12-inch tile.
1 foot in 20	18.6	26.8	74.4	150.0	270.0	426.0
1 " 30	15.1	21.8	60.4	128.0	220.8	346.0
1 " 40	12.9	18.6	51.6	108.8	189.6	298.4
1 " 50	11.9	17.0	47.7	98.0	170.4	269.0
1 " 60	10.9	15.6	43.4	90.0	156.0	246.0
1 " 70	10.0	14.5	39.9	83.0	144.4	228.1
1 " 80	9.3	13.4	37.2	77.0	135.0	213.0
1 " 90	8.1	12.6	35.0	72.5	127.0	200.5
1 " 100	7.3	11.9	33.1	69.2	120.6	190.5
1 " 150	6.7	9.5	26.6	56.0	97.3	154.4
1 " 200	5.7	8.2	22.8	48.0	83.9	132 5
1 " 250	8.1	7.5	20.4	42.4	74.4	117.0
1 " 300	4.6	6.9	18.4	38.2	65.5	107.0
1 " 400	4.1	5.9	16.5	32.6	60.3	90.7
1 " 500	3.7	5.2	14.8	30.1	54.0	81.6
1 " 600	3.3	4.7	13.3	28.0	48.6	74,0
1 " 800	2.9	4.1	11.4	24.0	41.9	65.0
1 " 1000	2.6	3.7	10.2	21.2	37.2	56.0
1 " 1500	2.1	3.0	8.5	16.8	30.8	47.0
1 " 2000	1.9	2.8	7.4	15.0	25.0	40.8

Great care should be taken to lay the tile true to grade, and various methods are adopted for this purpose. One of these methods is to drive an upright a little distance from each side of the trench where the hub stakes are planted, then nail a board level to these uprights at a certain fixed height above the bottom, say five feet, then stretch a fine wire or cord tight along the top of the boards. This wire or cord being, say, five feet above, and parallel to the bottom, the depth at any place may be obtained instantly by using a rod with a crosshead nailed to it at the height of five feet, or other height adopted.

If the grade of the trench is flat, the sag in the wire or cord may prove a serious defect, and a better method is to use the tops of the boards as a line of sights to give the elevation of the cross-

head, when the bottom of the rod will mark the grade line. Great care should be taken not to excavate below the grade line, as filled in earth will not prove as satisfactory as the undisturbed bed.

The cost of tile drainage per acre will depend upon the depth at which the tile is laid, and the distance apart of the rows of tile. Three feet is an average depth, and the rows of tile are run at distances of from about 30 to 200 feet apart. The cost of tile drainage depends, of course, on many different circumstances, and varies from say about $10.00 to $45.00 per acre, or $25.00 per acre may be taken as the average cost.

It is estimated that about one-third of the cleared land in the Province, or, roughly, say about five million acres of land, is in urgent need of underdrainage. In addition to this Ontario has another five million acres of swamp, marsh and waste land, which remains comparatively useless and too wet for cultivation.

In the year 1905 about 15,000,000 lineal feet of tile drains were laid, and in 1909 about 29,000,000 feet, and the total number of acres underdrained during the years 1905-1909 is estimated at 193,-436 acres. At the present rate it would take one hundred years to underdrain the five million acres of cleared land, which now produces only a partial crop, and if we acknowledge that all surface water should be carried off through underdrains it will be readily seen that a beginning has scarcely yet been made.

The benefits of underdrainage are in most cases so many and so great that we have not time here to go into their details. However, it may be mentioned that the clear profits to be obtained from successful underdraining amount, on an average, to $20 per acre per annum.

Thus tile drainage pays for itself in one or at the outside two years.

The Tile, Stone and Timber Drainage Act makes provision for the borrowing of money to cover the cost of tile drainage. Sums of $100.00 may be borrowed from the Province and paid back in equal annual payments of $7.36 for 20 years. Taking $25.00 an acre as the cost of tile drainage, $100.00 would cover the cost of draining four acres; thus four acres would have a charge against them of $7.36, or $1.84 per acre, for a period of 20 years, on account of drainage, and this $1.84 per acre would return the farmer from $11.00 to $36.00 per acre. This is certainly better and safer than all the get-rich-quick schemes that are advertised so freely at the present time.

Ditch Work.

Where a common outlet for any considerable tract of land is to be made the work should be proceeded with under The Municipal Drainage Act, and the first thing required by the engineer is to obtain as good a map of the locality as possible. The best thing usually at hand is an old County Atlas, and perhaps some additional information may be obtained from a Government topographical map. On some drainage areas only one route for the outlet is possible, but in other districts the best route can only be decided after a thorough examination or a topographical survey. The one great secret of success in carrying out a scheme of drainage work is thoroughness. Find out all there is to be known about everything. Obtain the correct names of the owners of all parcels of land, also the acreage each owner has draining to the proposed outlet, also the character of the land, whether gravelly, rocky, etc. (to give an idea of the run off), whether high or low. Sometimes this information can be obtained in walking over the land in addition to a talk with the owner, but if not, make a survey of sufficient thoroughness in order to procure all required data. When an engineer does his work thoroughly he has very little trouble with appeals to the Court of Revision, County Judge or Drainage Referee.

Frequently the new channel will consist of the enlargement of an existing one, in which case the old ditch should be cross-sectioned at a sufficient number of points to enable the quantity of excavation to be calculated as closely as possible. The hubs and marking stakes are usually planted along one edge of the ditch at intervals of one hundred feet, putting in intermediate stakes at bends or angles, as may be required. Usually the elevation of all the hubs along the berm of the ditch is obtained and the elevation of the bottom of the old ditch is also taken at every hub, or every second or third hub, or at such intermediate points as may be considered necessary. In addition to this the top and bottom width of the old channel is also noted. This rather rough and crude method generally gives fairly accurate results where the old channel is uniform, but a more accurate manner of cross-sectioning and one which can be done with comparative quickness is to stretch a good metallic tape across the ditch, the O end of the tape being provided with a loop which is slipped over the marker beside the hub; then the rodman, after first holding the level rod on the hub, holds it next at the edge of the channel, calls out the distance on the tape stretched across the ditch; then he moves down one side of the ditch or channel, holding the rod vertical at such points where the slope changes and calling out the distances on the tape, then moving

up the other slope of the ditch and out along the other berm to such distances as may be judged necessary, calling out the distance on the tape each time. The leveller marks down all the sights in the intermediate column and the distances on the tape, in the station column, bracketed off, under the number of the hub stake. When the grade line of the ditch is decided, the various cross sections may be quickly calculated by plotting each one down in pencil on a piece of bristol board on which is ruled in ink an outline of the bottom and side slopes of the ditch to be excavated.

This skeleton outline of the ditch plotted on say a scale of 2 feet to an inch, should have the feet and halves of a foot above the bottom, marked clearly thereon, and the tenths of a foot may be marked with lighter lines. The level book will give the elevation at each point in the cross-section above the bottom, and these points, with the aid of a scale and an offset, may be quickly plotted on the outline of the ditch, and the area of excavation at each cross-section can in this manner be easily and quickly ascertained with correctness.

Many different factors enter into the problem of designing ditches to carry off a certain amount of rainfall from a given area, and it is a rather difficult matter to arrive at anything like a scientific solution of the problem. A knowledge should be obtained of the rainfall and of what percentage would get to the ditch in 24 hours. The character of the soil, whether porous or impervious, the slope of the land, etc., must all be considered.

The adoption of a proper grade in order to obtain a velocity suitable to different soils in order that the ditch may not be eroded in certain portions and silted up in others, must also receive careful attention. The grade of a ditch must conform in general to the slope of the land, but by deepening the ditch in certain stretches and making it shallower in other places a grade may be obtained that will meet the requirement in a greater or less degree. On the question of determining grades, side slopes, etc., valuable lessons may be learned from a study of the action of water in the streams running through similar soils. When the grades are determined the velocity may be obtained by one of the various formulas given in works on hydraulics.

I quote the following:

$$v = \left\{ \frac{2\ \text{gri.}}{\text{m.}} \right\}^{1/2} = \left\{ \sqrt{\frac{2\ g}{m}} \times \sqrt{ri} \right\}$$

r = hydraulic mean depth = $\frac{S}{C+0.1c_s}$ in feet.

S = sectional area of channel in sq. ft.

i = sine of inclination = $\frac{h''}{l}$ in feet.

g = 32.2.

m = a comprehensive variable co-efficient.

C = wetted earth perimeter.

c_s = surface (air perimeter, taken at $0.1c_s$ for smooth channels, or $0.05c_s$ for rough channels.

l = length, referred to a horizontal plane.

h″ = vertical fall in the given length.

Values of m for open channels, and values of $\sqrt{\frac{2g}{m}}$

$r=\frac{S}{C}$	m.	$\sqrt{\frac{2g}{m}}$	$r=\frac{S}{C}$	m.	$\sqrt{\frac{2g}{m}}$
.25	.0500	35.89	7.0	.0096	81.90
.3	.0478	36.70	7.5	.0092	83.66
.4	.0440	38.25	8	.0088	85.54
.5	.0408	39.73	8.5	.0085	87.04
.6	.0378	41.27	9	.0081	89.16
.7	.0353	42.71	9.5	.0077	91.45
.8	.0332	44.04	10	.0074	93.28
.9	.0312	45.43	11	.0068	97.31
1	.0298	46.49	12	.0064	100.30
1.25	.0260	49.77	13	.0058	105.36
1 5	.0234	52.46	14	.0054	109.21
2	.0197	57.17	15	.0049	114.65
2.5	.0172	61.19	16	.0043	122.37
3	.0153	64.87	17	.0040	126.88
3.5	.0137	68.56	18	.0036	133.77
4	.0127	71.21	19	.0033	139.69
4.5	.0118	73.87	20	.0030	146.53
5	.0112	75.83	21	.0029	149 04
5.5	.0107	77.58	22	.0027	154.44
6	.0102	79.46	23	.0025	160.49
6.5	.0099	80.65	25	.0020	179.44

Having determined the velocity for certain assumed dimensions of the ditch, the required bottom width may be calculated to enable the ditch to carry off the quantity of water estimated to flow from the area to be drained, in a given time.

The question of the size of a main drainage channel is a rather complicated and difficult one to determine, depending as it does upon the porosity or imperviousness of its soils and rocks, the proportions of its steep, gently undulating or flat surfaces, also the ordinary and extraordinary rainfall of the district in which the drainage work is situated.

Besides the formula already given, a simple formula sometimes brought into requisition for obtaining the area of the waterways of culverts and bridges may be here quoted as follows:

$$S = m \sqrt{A}.$$

S being the waterway required in square feet, A the drainage area in acres, and m a constant varying from 0.2, 0.4 and 0.6 to 0.6, 0.85 and 1.1 (or other constants to suit the character of the soil) for flat land, gently sloping land, and land having a steep slope respectively.

While this formula may be of some use in determining the sectional area of the culverts and bridges required along the route of the ditch, they should always have a cross-section ample enough not to retard the velocity of the water, or cause eddies in the ditch. Narrow bridges tend to the erosion of the ditch in their vicinity and consequent filling up below. The openings in culverts and bridges are usually made wide enough to span the ditch from points taken in the centre of the side slopes, but the proper thing to do is to give a clear span at the high water line.

Certain large areas of comparatively level land may be satisfactorily drained on the assumption of a run-off of $\frac{1}{4}$ inch in 24 hours, while smaller areas will require a channel sufficient to carry off $\frac{1}{2}$ inch, or more, in 24 hours. One-quarter of an inch run-off in 24 hours will give .632 cubic feet per minute per acre, $\frac{1}{2}$ inch running off in 24 hours will give 1.264 cubic feet per minute, however, it must not be forgotten that flood discharges from small areas of say half a square mile may be anticipated of twenty one cubic feet, per minute, per acre, and from large areas of said five thousand acres, flood discharges of 4.5 cubic feet, per minute, per acre, may occasionally be looked for. A rainfall of 8 inches in 24 hours gives

a total of 20.168 cubic feet, per minute, per acre, and a rainfall of 2 inches in 24 hours gives a total of 5.042 cubic feet, per minute, per acre.

Many problems are solved from the drainage engineer's inner consciousness, but the better method is to procure and weigh all the data that can be obtained.

Respectfully submitted,

GEO. ROSS,

Chairman.

REPORT OF COMMITTEE ON POLAR RESEARCH.

Mr. President—Interest in the Arctic regions has waned since Commander Peary proved his claim to the discovery of the North Pole to the satisfaction of the U. S. Government authorities.

Dr. Frederick Cook lectured in Toronto on February 12th, describing in an entertaining way his journey over the Arctic Sea towards what the Eskimos call the "Big Nail."

The narrative of the second "Cruise of the Arctic" in 1908-1909 by Capt. J. E. Bernier, has been issued, as a Government Report, and should be on the Library shelves of all who are interested in Arctic exploration.

If the brave and courageous Captain had not been restricted in his movements by his instructions, he would doubtless have made the "North West Passage" from Davis Strait to Behrings Strait. Capt. Bernier formally took possession of many islands and coasts in the name of Canada, erected monuments, explored for coal and minerals, and recorded valuable meteorological observations. He also visited the winter camps of Franklin and other Arctic explorers who were engaged in searching for the Franklin expedition, and brought back many souvenirs of these hardy navigators. We sincerely hope that Capt. Bernier may again be commissioned by our Government at Ottawa to visit the Arctic Archipelago and continue the work for which he is so eminently qualified.

We are all proud of Capt. Bernier as a Canadian, and we believe that his explorations will result in a rich harvest to future generations.

The potential wealth of these immense tracts of land may be considered as problematical by many, but so was all Canada by Louis XIV., so was the Yukon District not twenty years ago. Ten years ago who would have prophesied that our Cobalt district would yield over Fifteen Millions in silver in one year? Every acre of land between the Meridians of 60 degrees and 141 degrees that belongs to Canada should be jealously guarded from foreign exploitation.

The following news item from London, dated February 24th, respecting the race for the South Pole, will be of interest. There is a probability that one or both of the Antarctic parties may return before this report has been published in the proceedings:

"News of the discovery of the South Pole is expected to reach London at any moment, and already the newspapers are beginning to discuss the chance of the rival expeditions of Capt. Ronald Amundsen and Capt. R. N. Scott.

The Westminster Gazette has a timely article by a man experienced in Polar matters, who says: At any moment one of the southermost Cable Stations may spread over the world the message that the second of the great Polar mysteries has been solved, and that an explorer has succeeded in doing in the Antarctic what Admiral Peary did and Dr. Cook said he did in the farthest north.

In the midst of all uncertainty all that we know practically certain is that the great race, which is surely the most remarkable that has ever been run, is by this time lost and won.

Who was the winner only a cablegram from Stewart Island or Tasmania, to which it is expected Amundsen will steer the Fram, can tell us, but if Amundsen made the earlier start and the earlier return, the two expected messages should not be far apart.

The Fram has the longer journey to make, and the Terra Nova is the faster vessel, so that what we are awaiting may actually be the result of the greater race that preceded it."

Sir Ernest Shackleton, the famous Antarctic explorer, when interviewed on the subject yesterday, favored the chances of the Norwegian.

"Of course Capt. Scott has great experience," he said, "but then, you know, the Norwegians can live on the smell of a stone. On the other hand, Capt. Scott's equipment is splendid, and that is a great point in his favor. The two parties must meet somewhere on the journey. Whichever party loses in the race will join hands and come back with the winners. If they should both meet at the Pole, it will be a race to see who sends the first news. Amundsen's ship is slower, but Scott has a party to pick up at Cape Adair."

A Copenhagen dispatch says that the Geographical Society at Christiania held a meeting to discuss when Amundsen might be expected back from the expedition to the South Pole. All the members agreed that no news of the expedition could reasonably be expected before March. .

It was generally held that Amundsen and party reached the ice barrier long ago, but they were unable to advance, owing to the ice being much thicker than it was last winter.

It is also believed that they have better chances than Capt. Scott, the Norwegian explorers having taken dogs with them as these animals can stand the cold better than horses, which accompany the Scott expedition.

An Australian Antarctic Expedition under Dr. Douglas Mawson in the "Aurora" sailed from Hobart Town on December 2nd, 1911, for the Antarctic, possibly to take possession of the regions, in emulation of our Capt. Bernier.

Respectfully submitted,

WILLIS CHIPMAN,

Chairman.

REPORT OF COMMITTEE ON LAND SURVEYING.

Mr. President—In the presentation of Committee Reports it appears to have been the practice to deal with matters of a non-contentious character. This report tendered for your adoption may, perhaps, not fit in with the standard heretofore in vogue.

The Chairman of the Committee of Land Surveying, in common doubtless with a great many other delinquents who fail to provide Epicure fare for the members present, received a request

from our worthy Secretary to prepare a paper, and failing to meet this request presumes to interject some personal opinions into this report. As is commonly the case the Committee on Land Surveying is a paper Committee only, a sort of post card exchange.

A matter which appears to be engaging the attention of a large number of our members is that part of the Registry Act dealing with the filing of plans of sub-division. As far as your Committee can ascertain this Act seems to be strenuously endeavoring to define what was actually done in the field, and the Surveyor appears to be quite as strenuously trying to sidestep the issue. The certificate required to be placed on plans for registration, which states that said plan is an accurate representation of the land included therein as surveyed and sub-divided by him, was doubtless intended to be construed, as it has been construed by those surveyors who are less astute and resourceful than other members of the profession, to mean that such survey and sub-division was actually performed in the field. Finding however that there were paper surveyors as well as field surveyors, the poor Registry Act endeavours to protect itself by requiring that all posts planted in the sub-division be shown on the plan, and by a later amendment, that field notes of the survey be filed, all apparently with the object of curbing the individual who prides himself upon his ability to win out on technicalities. A letter upon this subject with a suggested remedy has been received from the Guild of Ontario Land Surveyors of Toronto.

It would appear to us that the true remedy rests in a stricter interpretation of the certificate at present required to be placed on such plans. While it may be convenient for the surveyors of a very few localities to take advantage of the non-posting interpretation, the profession as a whole suffers as a result. It is not necessary to mention that the real estate artist is abroad in the land and that his operations are not confined to properties immediately required to accommodate the overflowing population of our cities and prospective cities, but are rather gauged to accommodate the speculative appetite of the public to absorb, in the form of town lots, much land that should be used for a considerable time to come to grow farm crops to feed the urban committees. Such being the case the main object of the real estate boomer is to obtain plans that will be accepted at the Registry Office and entail as little expense as possible upon himself. Now what is the surveyors position? Passing over the loose interpretation of the statute that allows him to post or not to post as may appear to him more profitable; there are several other phases to deal with. In localities where the land sub-divided or registered as having been

sub-divided, must of necessity, in a very short time be actually posted; no financial loss will accrue to the surveyor, as even if the block corners were posted before registration, land will be too valuable to tempt the layman to make his own surveys. In localities where values are highly speculative, however, the surveyor who makes these plans, and perhaps even goes so far toward completion as to post the block corners, seldom sees any more of this sub-division, as the real estate man's interest ends with the sale of his lots.

In the interest of the Association at large it would appear to be desirable that steps be taken to have the clause in the Act relating to the filing of field notes struck out and the Act so amended as to require all lot corners in the sub-division to be properly posted before the plan is registered.

Another matter which we would ask you to discuss is the advisability of appointing a special Committee to examine into and devise ways and means of expediting the business and increasing the working efficiency of the Association. Many suggestions have been made from year to year upon matters of general interest or of importance to particular sections of our Association, but through lack of proper working facilities these suggestions are allowed to drop after a more or less perfunctory discussion, and their originators are dismissed without that assistance or advice which it should be the main business of this society to render. This condition of affairs does not tend either to create or to retain the interest of members, and it loses much valuable material that might be used in reforms and improvements to the benefit of the profession at large. The impression created as a result of this inactivity or scant consideration may also have an important bearing on the matter of collecting fees. This latter subject has become a hardy perennial; but instead of adopting the drastic measures which at times have been proposed by some members it might be wiser and more effectual to so place our house in order as to convince the most sceptical of these non-paying gentlemen that the benefits received far outweigh the fees required. This might have the advantage of making friends and creating active assistants instead of rousing antagonism which we can ill afford.

As to the means of accomplishing the above result this would have to be worked out in detail by the proposed Committee. We would only suggest that the proper lines would appear to us to be the strengthening of Committees, the setting apart of ample time at the annual meetings for Committees work, the reference to the respective Committees of all matters coming under their particu-

lar jurisdiction and upon which each Committee would make a definite and concrete report which could be acted upon by the Association as a whole; and finally the strong support of the whole body to the work done by the Committees.

To those who may consider that things are well enough as they are we would point out that it is not long ago since an effort was made to form a separate Association of the surveyors practising in the mining sections, and at the present time there exists an organization known as the Guild of O. L. Surveyors of Toronto. While it may be quite right and proper that local practitioners should band together for mutual benefit and improvement, it is nevertheless a fact that if this division continue its effect must be to weaken this Association, which should and must, if it is to succeed and progress, place itself in such an efficient position as to take carefully and satisfactorily of all the varied sectional interests of its membership.

Respectfully submitted,

J. McC. WATSON.

Toronto, February 9th, 1912.

J. McC. Watson, Esq., O. L. S.

Chairman of Committee on Land Surveying.
Association of Ontario Land Surveyors.

Dear Sir,—

I am instructed to forward to you for the consideration of your Committee the following extracts from the minutes of a meeting of Ontario Land Surveyors practising in Toronto, held on Tuesday the 6th. inst.

Firstly—"That in view of the difficulty of complying with the recent addition to the Registry Act requiring the filing of field notes with the registered plans, this meeting recommends that the clause be struck out and that in lieu thereof the form of Surveyors Certificates as prescribed by the Act be amended by the addition of a clause stating precisely what monuments, stakes, or other permanent marks for the purpose of defining streets or lot corners, were planted in the original survey; and, further, that in the case of a plan filed before the staking is completed, and which plan is subsequently, within one year of the date of the filing, completely staked by the Surveyor who made the original plan,

it shall be necessary for the Registrar on receipt of notice in writing from the said Surveyor that he has performed such subsequent staking to certify the same on the plan; and further, all stakes so planted and certified shall be considered original stakes."

I may say that the latter portions of this motion were discussed with the idea, not only of settling the doubt that has existed as to the status of such stakes, but also of protecting in some measure the Surveyor from the losses caused by the inaccurate planting of stakes by unauthorized persons.

Secondly—"That in the case of allowances for roads graded, travelled and fenced for a considerable period but not agreeing with the true limits as originally laid down, steps be taken to obtain legislation to give power to establish the limits of such roads as travelled, by measuring 33 feet from the centre line thereof, thus obviating the necessity of a municipal survey and its consequent delays, and arriving at a conclusion which is more in accordance with established conditions."

The local Surveyors will be glad if your Committee can give these matters consideration before the Association meeting, so that they may be introduced then and some decision arrived at.

Yours truly,

TRACY D. LE MAY,

Hon. Sec.

Toronto Guild of O. L. Surveyors.

Discussion.

The President—Gentlemen, you have heard the report read by Mr. Watson and it is now open for discussion.

Mr. Kirkpatrick—There is just one thing there that I would like to draw attention to with reference to the Master of Title's Return. He spoke to me yesterday as to the filing of plans, in the Local Master's office, of sub-divisions of the original plans, and he says very often the original lot lines are put in full lines and the lot numbers are put in full figures. He would rather see them put in dotted lines and the original number of the lots also dotted in, not put in full figures. He also says he would like very much to see a governing line put in for the lot lines. This is very easy to do.

Mr. Watson—Nearly every registrar or local Master has his own ideas on that.

The President—If you appeal to the Master of Titles he will give instructions to the local Masters.

Mr. Murphy—All these matters are dealt with in the Land Titles Act.

The President—What about the posting of the lots, Mr. Murphy?

Mr. Murphy—We have considered that here in the City and there are a great many sub-divisions where the survey is done in the winter time, and everyone knows, who is a practical man, that you can't stake out with wooden stakes that can be marked, in the winter time. In consequence we have been in the habit of blocking out these sub-divisions, we mark the block corners with iron bars or some other permanent movement, and the plan is filed immediately. It would be a great hardship to many, therefore, to adopt the suggestion which Mr. Watson makes that it should not be possible to file a plan like that until the whole staking is completed, because that would delay the matter for a long time. There must be some other way of doing it.

Mr. Watson—Posting is quite possible and we do it right along in our country and it is just as cold as it is here. It is only a question of expense.

Mr. Beatty—I don't see where the trouble or difficulty arises in posting lots in the City of Toronto in the winter time. Supposing you can't drive the wooden stick, what does it cost to get a few iron bars and drive them? Wouldn't it be better to do that than let it go?

Mr. Murphy—No, it is not desirable; it is very undesirable and very expensive. In long blocks it is very desirable where there are a great number of stakes to have the lot numbers marked on, and you can't mark them on small iron stakes.

Mr. Watson—The surveyor doesn't have to pay for it.

Mr. Murphy—If we could get some way by which all the expense of these things could be thrown on the public it would be all right, but they throw the burden of doing it on us, and that is what I don't like about it.

Mr. Beatty—Do the surveyors not get paid for the work they do?

Mr. Murphy—We don't want to make the cost absurd. The cost of iron alongside of wood would be five or six times what

wooden stakes would be, and a well planted wooden stake would last for a number of years, and any boy can pull the iron stakes out in the summer without the least trouble. It is the principle I object to, why should the Act compel us to stake out a place entirely. The idea is good enough, I have no objection to staking the lots out, but it is the time at which it is to be done.

Mr. Watson—Mr. Murphy is speaking from the standpoint of the City of Toronto. I think the certificate is clear enough on that. Probably the land you sub-divide here would require to be staked and built on within a short time, but all over the province they are sub-dividing properties simply to sell and they don't care about staking out the lots at all. Once they get the plan they are satisfied. We don't have the posting to do, and that is what we want to protect ourselves against.

Mr. George Smith—I make a good many sub-divisions both in the winter and summer and I never think of allowing anybody to get hold of the plan with my signature on it until the last lot upon it is posted and numbered. Generally I do as much as I can in the winter time and then in the summer time finish it, and I don't by any means consider my work done till it is all staked out, because I think when a surveyor puts his name on a plan it ought to be over a certificate which means it has been surveyed and sub-divided.

A Member—If a certificate goes on the plan stating that the land is surveyed and sub-divided by me, can any other meaning be put on it?

Mr. Murphy—I think it could be got over by leaving the word sub-divided out and have simply "Surveyed." I don't think there is anything more required than that. There is another thing about it, with reference to putting posts in within a year, that is a very good thing, because if the land is ever wanted to be posted it will be known that the posts referred to are the original posts, that they are not put in by some unauthorized person. We have had a lot of trouble in the City by this very thing, and it is cropping up all the time. An authorized surveyor will make a plan and some person else will put the stakes in, I have had experience of this, and I think Mr. Speight will tell you his experience, we found things were totally inaccurate; lots that are shown to be square on the plan are really diamond shaped. They draw conveyances here with all kinds of restrictions and covenants. A house must be so far from the lot line and so far from the street. If you get an irregular lot line like that, these restrictions cannot be complied with.

Mr. Watson—While your remarks may be all right for the City of Toronto, it puts the outside people up against playing the sucker to the real estate people, and that is all there is in it.

Mr. Smith—I remember a case. I laid out Cedarhurst, Lake Simcoe, and submitted a draft plan to the promoters of the scheme and that was acted on and a good many sales made, but everything was on the understanding that the sale was not closed up until the plan was finished up and filed in the regular manner, which was not done till the spring. The post corners were all marked with the numbers of the lots. That is about the way I generally get things done. I know you can't do that in the winter. But don't sign a plan until the work is finished on the ground.

Mr. Fitton—I think the posts should be put in before the plan is filed in the Registry Office and I think when we sign the plan and put the certificate on it it means that the posts have been properly put in.

Mr. Gibson—Have the plan made and the stakes planted marked on it, make it obligatory. Another point is, what they call the governing line—putting in the word "governing line." I discussed that with the Master of Titles and he said with the words "governing line" you should have stakes planted to fix that governing line, to show where the line was and have it defined by the plan.

Mr. Fitzgerald—I quite agree with Mr. Watson and I don't see how any surveyor can put that certificate on unless he has made and staked the sub-division on the ground. Besides, if you only stake the outlines and do the rest on paper, not one surveyor in a hundred can go on that ground and make it exactly tally with the plan. I think it comes down to a question of interpretation of the meaning of the certificate.

Mr. Murphy—We are bound down tight enough already and it should be optional with us whether we stake out the sub-division or not. I understand these men who are practising in the country do not see it as I do. It is quite true there are a whole lot of real estate men and all they care for is to get plans whereby they can make a sale of these lands and they don't care tuppence afterwards what happens; but then again you have got to consider that the kind of land we see advertised in the newspapers now, up in Saskatchewan, will never amount to anything. It will go back to farming lands; but when we are dealing with valuable properties here, there are practical difficulties. Everyone here will agree with me who has had experience in the City that it is not right to bind ourselves down in these details.

Mr. Watson—I think all the land surveyors practising around the City of Toronto would agree to let that Act apply to their locality as it is.

Mr. Murphy—We suggested certain amendments which we think would be good.

Mr. Watson—But you can't put that in legislation.

Mr. Smith—I think we had better take a leaf out of the legislation of Alberta. They are going to pass an Act and they go a little further than I would go. The lots must not be under 50 x 120 feet, but everything has got to be signed and finished up by a land surveyor in the Province of Alberta. The last issue of Saturday Night gives a fair idea of that. We want some legislation giving a proper interpretation to those words, stating what is meant by "This land has been surveyed and sub-divided by me." It must be surveyed and sub-divided before we can sign it.

Mr. Aylsworth—I don't agree with the idea that there should be special legislation for Toronto and other legislation for outside. I think the whole burden of our efforts should be towards making surveys more permanent and making the corners more permanent. The whole trouble to-day is in having wooden monuments. I think there ought to be more iron posts, at the corner of every block say, but I don't think the idea of letting in legislation like this is in the interests of the public or of the Association or anybody else. One of the speakers said when he went on the ground after one of these paper plans was registered he couldn't make the measurements agree with the plan. What are you going to do? It is going to be an unsatisfactory job all the way through; one fellow signs the plan and the one who makes the survey afterwards has to put measurements on his plan that are not there, and they won't agree, and he can't make them agree. I think the whole burden of the efforts of this association should be towards more permanent corners.

Mr. Murphy—There may be something in what has been said in case of a dishonest job where a fellow has represented something on a plan that is not so, but if there is fraudulent work on a plan it is the business of the Association to deal with that in another way. We have been trying to deal with such a case here for some time. Here there are persons making surveys, I wouldn't say fraudulent, but irregularly and we don't seem to be able to find the way of getting at those men. I think that the method we have suggested for doing those sub-divisions, blocking them out with permanent monuments on the foundations and then putting in the stakes at the corners of lots afterwards, when it is convenient to do so,

will fill the bill all right. If there is any fraudulent work done I think it is the business of the Associatioin to proceed against the men who do it. We have all the machinery that is necessary for doing so. We don't want any more laws or legislation.

Mr. Watson—As far as non-professional people putting in posts are concerned, if you put your posts in beforehand they haven't got any chance. As far as machinery is concerned, we have got too much now; we don't use it, that is all.

Mr. Routly—I think this question of posting lots is a very timely one. There is a great deal of sub-division being done at the present time and we should be a unit on the method. I am very much in favor of the idea of permanency and accuracy in the matter of surveys. I think it is not only for the interests of the profession, but very largely for the benefit and in the interests of the general public. I can remember when I first went to the north country that clients used to come constantly, and all they wanted was a plan. If I would make a plan they didn't want me to go near the ground at all. A few surveys were just made in outline and plans made. The department said this was not right and the surveyors in the north country for the most part were not in favor of it. They said, if the department calls for a complete survey we will insist on making a complete survey. The same thing was carried out in connection with plans. There was a time when it was believed by the surveyors in the north country that a complete set of plans for mining claims consisted of three plans in which the whole group was shown. Now, for a year and a half or two years nearly every surveyor in the north country understood that this was sufficient. But through letters from the Department we found that that was not sufficient, the Department required three copies of each individual claim. They also were glad to have us plot a general plan of the whole group. I think now with one exception the surveyors in the north country insist on making a complete set of plans at the time the survey is made. The survey consists of the work on the ground, and a full set of plans, and I don't remember having heard any objection from any of our clients for months. There was some objection in the first place.

In connection with sub-division plans in the north country my firm has had a good deal to do. We always post them unless it is very rocky ground where the posts cannot be put in. Very often, if it is summer time, we make a mark on the rock. I remember in one or two large sub-divisions in Porcupine we drove the stakes as far as we could in the winter time, and we found it quite easy to drive them accurately because the snow seemed to hold the stake in position, and then in the spring we sent a man around to

drive them down further. I recognize that in Toronto and places where the snow is swept off the ground and thrown on the road that the ground is left bare and it is very difficult to get posts in, either iron or wooden. But I don't see any reason why surveyors couldn't insist in their original bargain with the client that the survey should be completed, say in six or eight months. The surveys should be finished on the ground as soon as possible, and it is in the interests of the general public for this reason, supposing you lay out a plan in block outlines and the real estate agent sells a number of lots, the people who buy them in some cases want to go and build, but they can't find any stakes. Then they are compelled to go to the expense of taking a surveyor out there, to locate the lots. The work should be completed on the ground by the surveyor for the real estate agent who first ordered th survey. We should have some agreement among ourselves, I don't think it is necessary to have special legislation.

Mr. Watson—I would be quite satisfied for you to accommodate yourselves to local conditions as far as you could, but I don't think you can do it without raising a lot of trouble outside. Legislation seems to be the only thing that will really govern us. If you take any agreement between ourselves, it might be binding on some and the others wouldn't find it convenient. I don't think you can make any exceptions, there must be a hard and fast rule.

Mr. Fitzgerald—Wouldn't it be a good thing to get the solicitor of the Associatioin to give us a good full interpretation of the certificate that we put on.

The President—I think that would be a matter for the local Master rather than for our solicitor because it seems to me it is altogether in his hands, he is master of the situation.

Mr. Fitzgerald—Evidently some surveyors in Toronto conscientiously think when they make the outlines in the field and put the plan on paper they can put that certificate on. I wouldn't sign the certificate on a plan unless I had put in every post. I never have done so.

The President—I think at present we have got the machinery. It is just a question for the Local Master to interpret that.

Mr. Ward—There are a lot of plans here where there are buildings and occupations. You couldn't very well stake out the individual corners; they are already occupied by buildings. We find the numbers on the plan, but the centres of the walls and sheds and the boundaries are all fixed on the ground. What would be the use of stakes in those cases?

The President—That would be an exception.

Mr. Watson—"Posts" is only a technical expression and may mean anything, but you should show the point on your plan and not leave it to some future survey to perpetuate those points. It is a matter of completing your field work before the plan is registered, that is the idea. The whole thing is you don't make your interior surveys. They make outline surveys, and possibly in some cases they don't even do that correctly.

Mr. Murphy—That is a thing that should be decided in another way. If there is anything fraudulent, and humbugging that should be dealt with by the Association.

Mr. Watson—We can't do it.

Mr. Murphy—I can say quite conscientiously I have done outline surveys in winter and staked them out afterwards scores of times. The intention is that the plan shall be staked out; it is only a matter of convenience and saving of expense to our clients, not staking lots in the winter time.

There is another thing, in the City there are cases where it would be impossible to put in stakes. I had an instance the other day. A gentleman on Yonge Street who wanted to draw some agreement and partition the estate kept hammering at me to put in an iron stake with a cross bar on it. I said, It is impossible to do such a thing. There is a granolithic sidewalk about a foot thick and below that I don't know what. He said, We must have an iron stake put in. It would take a laborer a couple of hours there to drill a hole and put a stake in.

The President—Isn't that an exceptional case?

Mr. Murphy—Not quite so exceptional as you think. It is absurd to say that you should plant stakes at all the corners. There are the centre lines of walls, sheds and out-buildings and they become boundaries and are shown on the plan as boundaries; I think a person who has ever seen a plan of this kind would never raise such a question. But what I object to is anything that binds us down. We are bound down enough already. But if there is anything fraudulent, any person going in who is not an authorized surveyor, and planting stakes in the way we are complaining of, I think they would be prosecuted and made an example of, because it is very annoying to us and to the public too.

Mr. Ardagh—I quite agree with the posting of the lots, but in the Registry Act it says "posting, if any."

Mr. Watson—As there is a great difference of opinion on the thing it might be as well to refer it to the Master of Titles and get his opinion and settle the matter afterwards, but there seems to be some misunderstanding as to the point between local conditions and outside conditions. As far as planting posts is concerned you plant posts where you can plant them. We don't expect to plant posts where the party wall is a division line, but what I did suggest in that report and what the Surveys Committee reported was that all the interior work should be completed, whatever can be done, and the points governing the lot boundaries should be shown upon that plan and not put in afterwards, because it sometimes happens that it is not completed at all. I think it would be as well to refer the matter to the Master of Titles to get his interpretation of the certificate because I think a fair interpretation of that certificate will insist upon the points being marked before the plan is registered.

The President—The motion is that the matter be referred to the Master of Titles and the Inspector of Registry Offices and the report stand over until our next annual meeting.

Mr. Beatty—I second that.

(The President put the motion which, on a vote having been taken, was declared carried.)

Mr. Watson—There is another matter in connection with that Report. I have suggested a special committee should be appointed in connection with that report and I would like someone to move that a committee should be appointed.

The President—I would make a suggestion that Mr. Watson, Mr. Speight, Mr. Murphy and Mr. Aylsworth be a special Committee to consider that matter.

Mr. Ardagh—I have pleasure in seconding the motion.

On the motion being put to the meeting and carried, the following Committee were appointed: Messrs. Watson, Speight, C. F. Aylsworth, Murphy and Ward.

FIG. I.

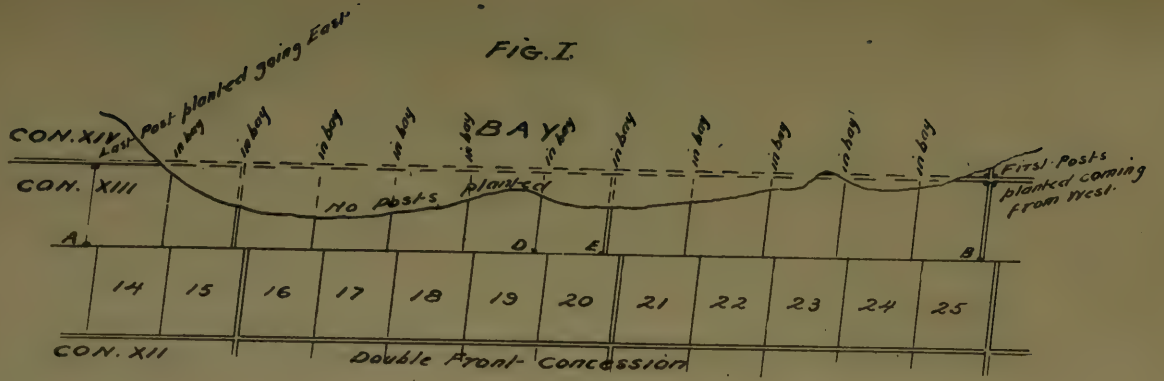
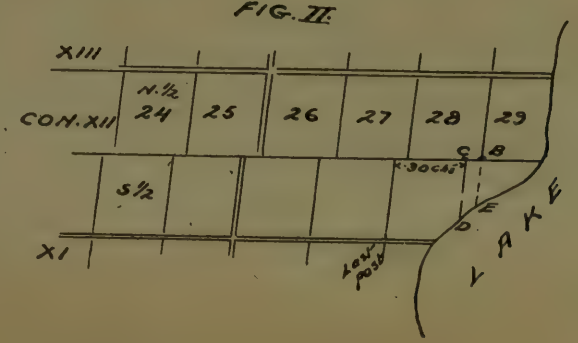

Last Post planted going East
CON. XIV
CON. XIII
in bay
BAY
First Posts planted coming from West.
No Posts planted
A
D
E
B
14
15
16
17
18
19
20
21
22
23
24
25
CON. XII
Double Front Concession

FIG. II.


XIII
CON. XII
N. ½
24
25
26
27
28
29
S ½
C
B
E
D
LAKE
XI
Last Post

1. In Figure 1 the field notes are of record as shown. The lots are patented as broken lots, with measurements from concession line XII-XIII on a continuous bearing to the shore. In survey, the points C, D, E, were determined by equalization between A and B, and the distances shown between the fronts divided equally. The line given in the field notes as projected across the water being used in the division.

(a) Is the survey correctly done?

(b) Is the projected line the front of the concession or is the shore line?

(c) Is Section 43 of the new Act meant to cover cases of this kind in double front concessions as well as in alternate concessions?

ANSWERS.

(a) The lines for north halves of lots should be located by proportional sub-division between points A and B as in the survey mentioned.

(b) The front of the concession would in this case be the shore line.

(c) Section 43 was intended to apply to double front as well as to alternate concessions.

QUESTION.

2. In Figure II the line between the southerly parts of broken lots 28 and 29 was run as shown by C-D and not by production of C-D to E.

The principle of Sub-sec. 2, Sec. 34 of revised Act of 1911 was used in running C-D. If this clause refers to alternate concessions and cannot be legally used to support this survey, and there is no other clause, should not a clause be inserted to cover such cases in double front concessions, as the principle is evidently an equitable one? Is there any authority for the production of A-B to E?

ANSWER.

2. The line C-D as shown on Fig. II is correctly located.

FIG. III.

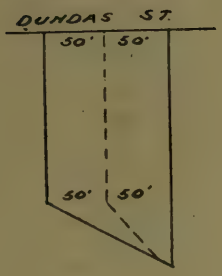
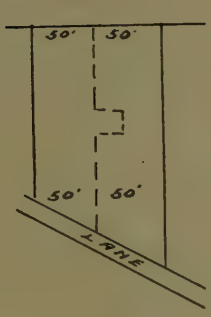


FIG. IV.



QUESTION.

3. "Stuart Hooey and Mrs. E. M. Tripp both bought half of the same lot on Dundas Street, Trenton. It is irregular in shape and fronts on Dundas Street. A dispute arose when Mrs. Tripp started to fence off her half. She took half the frontage and ran a line through at right angles. This left Hooey with less than half the area. He sued, and County Judge Deroche declared him entitled to half the area. This left Mrs. Tripp with less than half the frontage on Dundas Street. She appealed to the Divisional Court, which found the question so knotty that in giving judgment all three judges forgot that they have recently acquired a stenographer, and wrote their judgments by hand.

The hand-made judgment, however, are full of Solomon's wisdom. The Court declares that everybody has been wrong, and so there shall be no costs. The line shall be drawn from the middle of the frontage parallel to the sides as far as the lot is regular, and where the irregularity commences in the rear of the lot, the line shall be deflected to give each of the parties half. This gives both half the area and half the frontage.

I noticed the enclosed decision in an issue of the *Telegram* this month.

Supposing the lot to be as per Fig. III, the decision would cause the division to be as shown in dotted line.

Would it not be more equitable if there was a lane in the rear to divide as in Fig. IV.

Would not the chances be that a Court of Appeal would sustain such a contention enabling each party to have also an equal frontage on the lane?

ANSWER.

3. This question was received too late to be considered by the Committee and is published for whatever value it may possess as a judicial decision.

DISCUSSION.

Mr. van Nostrand—I was unfortunately absent when the report was read and I was quite surprised to find that the question drawer had been omitted. It is a matter altogether out of the ordinary procedure, because we have always felt that the Committee on Land Surveying was really the general committee of the Association; the other committees deal with matters that are of interest to a minor number of the members, but the Land Surveying Committee is the one that is at the foundation, the one that has to see to the difficulties that are in the Survey Act, and to consider them and to help the member that is remote from advice, as to the matters that turn up from time to time in his practice.

The findings of that committee are to be very carefully considered, and the final result should be as if it came from the last court of appeal. I claim that we know more about our own business than even a High Court Judge, and if the findings of the committee are not agreed to by the Association, then it is for the Association to change them, until the result is a proper answer to the question that is asked.

In the 3rd paragraph the matter of the Registry Act is dealt with and we in Toronto have been very much exercised over the recent changes in this Act. We went along as usual making our plans and sending them in for registration, until we found that field notes must be produced and filed with the plans; we found it difficult to get anything to satisfy this demand. In its literal sense we could not find any use for it, nor any reason for its having been put in. About two or three weeks ago the Registrar told me that it had been inserted to choke off the country surveyors, who were making subdivision plans without having made any survey whatever. This explanation we were very glad to get, because we thought that there might be some sinister motive behind it. It should be the duty of the Council to watch all legislation that would in any way affect the surveyors, and if they can, so to direct it as to get the best results, but when new legislation is proposed, notices

should be sent to every member, for we have gone on not knowing anything about these changes, and if it be so with those who are within a stone's throw of the Queen's Park, what must it be to the man that does not meet another surveyor once in three months.

This filing of field notes we hope to have eliminated; the surveyor has to sign a certificate and if he has not made a survey he has signed something that is not true, and he ought to be disciplined for improper practice. We asked at one time to have a clause inserted in the act providing that all posts planted in the original survey should be shown in the plan, but that did not come before the notice of the surveyors and we found some here in Toronto who disregarded it for months after it came into force; we found that they had staked every lot and there was not a sign of a stake on the plan, and we thought that we would get over that by having the certificate amended so as to state that all the posts planted were shown on the plan. The idea of course is, that a surveyor going on the ground afterwards to make re-surveys knows where to look for posts that he must respect and what posts may be disregarded as not being original.

With regard to the posting of all lots that was discussed over and over again. About four or five years ago we had a very strong letter I think from a surveyor in Ottawa demanding that every lot be posted; that was considered carefully and it was held to be not absolutely necessary that all lots be posted in the original survey. I think Toronto surveyors may claim to have had more experience in subdivision work than others, for it is by this work that we have been getting our bread and a moderate amount of butter on it, and if we thought it advisable we would gladly have it compulsory that every lot should be posted before the plan is registered, but the effect of a restriction like that would be practically shutting the real estate agents' doors from October till April; this winter they have been doing an active business in selling lots, and preparing for a much more active business when the summer comes. In order to enable them to make sales of any properties purchased after the frost has come, they must have a registered plan. It is not possible to sell lots by agreement unless they can identify them, so that when the deed is registered it will be shown that that lot is the exact lot that was sold. It seems impossible to make a proper transfer unless by a registered plan.

Are we going to say to the real estate men and to owners of real estate for sale that they shall not sell any lots until the frost is out of the ground and posts are planted? If we do that, we will have a great deal of trouble, and further than that, we will have the work that might be reasonably distributed over six months thrown

into six weeks. Any Toronto surveyor feels that that would be impossible; we have not got enough surveyors if all that work was to be crowded into the opening of spring. Whenever work of this kind comes, it is the custom of many surveyors to mark the street corners by means of iron boundary posts, which can be done in the winter, and leave the staking of the intermediate lots until the spring; that we consider the best way out of the difficulty, but the objection has been made by some of the real estate men that having sold a lot it might not be staked out.

The real estateman often finds it to be to his own interest to have a numbered stake standing at the corner, with the number stencilled on it; he takes his purchaser down the line and he points out these lots by their numbers, this is the actual practice here, the cost of planting the intermediate stakes is not very much; in fact it is a negligible quantity.

The opinion has been expressed here that the wording of the surveyor's certificate does not admit of anything but the staking of every lot. I cannot agree with that, and there are a number of surveyors who cannot agree with it; we must have some latitude and we must meet the cases as we find them. If we look for precedents, if we look to New York, we find that their universal practice is the same as ours, and they do it much more carefully than we do, but the intermediate stakes are not planted; if they can do it there I do not know why we cannot do it here, or do as suggested, leave it to the option of the vendor of the property and have the intermediate stakes planted later if he requires it. I believe if a surveyor does not know more, than any other professional man, of his own work he is not a competent surveyor, and if we are properly equipped we ought to be better informed than any lawyer or any judge. We had a whole year's wait before what we asked for was accomplished; the request was put in by the Guild of local Toronto surveyors, and it seems to have stirred up a little animosity; we had to have a name and we have got together for mutual protection and to promote the interests of others and of the public, and here once more we claim to know more about our own business than any committee. I move to rescind that motion that we be asked to wait for a year until that matter is settled.

Mr. Sewell—I beg to second that.

The President—You have heard Mr. van Nostrand's motion, seconded by Mr. Sewell. I think we should get an interpretation of that certificate in the proper way.

Mr. Murphy—I do not think we should allow an interpretation to be put on the certificate without our having our say about the

matter; the question was decided that we should leave it to the Master of Titles. I can very well understand that the Master of Titles is not a partisan; he understands about the difficulties we meet, and whether it is reasonable to suppose that every lot should be posted; we should look at it from every point of view, as well as from the point of view of our own interest; we want to do the work we get and we want to do it with the least trouble, and I think it would be a very bad thing to have any one else tell us what is best for our interests and for the interests of the public. In staking out lots we stake them out as a matter of policy, but it is really impossible to do that sort of thing in the winter, and we should not be bound down to do impossibilities.

A Member—I do not think that this motion should be put and carried now, when all these gentlemen are absent that were here yesterday. I do not think it is a fair deal that a motion of that kind should be put.

Mr. Fullerton—I was not here yesterday when that was discussed, but it seems to me that it would be rather an awkward predicament to crowd six months' work into six weeks. I know that it would be absolutely impossible in the part of the country I practice in to plant posts in the winter. I am in favor of that motion; it is all right for me; I do not see any objection to it.

Mr. Stull—I see no harm to leaving these posts out in the meantime if you have the street corners marked; I do not see any reason why the intermediate posts should not be planted in the spring, and I do not see how it affects the certificate.

Mr. van Nostrand—So far as the question of irregularity of proceeding goes, I think we are quite within our rights; the discussion was not completed yesterday and it is still open; the whole matter is still open and it is proper for us to deal with it in any manner we see fit.

The President—I think the question is still open; the report was not handed in yesterday; that is the report of the land surveying committee; it was not before me and we could not deal with it; I think the question is now open for discussion.

Mr. van Nostrand—So far as the question of unfairness goes, I do not wish to be unreasonable in that; if those who are interested were not present yesterday why should their rights be dealt with; only one of our local members was present yesterday, and I am only anxious that this should be thoroughly discussed, not only in the interests of the surveyors, but in the interests of the public as well.

I think we are dealing with it fairly if we conclude to take it up again to-day notwithstanding what was done yesterday.

As I said before, it will be absolutely impossible to do the work that will be required here in the spring if some preparation for it is not made in the winter time and what preparation can you make unless you make careful block surveys and prepare your plans for registration. This must be done as carefully as we can do them. I still support my motion.

The President—I think this motion is quite in order and I cannot see anything wrong about it. As far as learning from our American friends is concerned, I do not see anything wrong about that either; I think we can profit by that.

Mr. Fitzgerald—I do not see that it is going to do any harm to have an interpretation of the certificate; there seems to be some doubt about the meaning of it.

Mr. Murphy—There are some members of this association that are doing improperly what we have been talking about, and they ought to be told in a quiet way that the Association has got power to deal with men that do that kind of thing, and I do not think that the rest of us should be hampered on that account.

Mr. Fitzgerald—You might put a note on the plans that you have only marked the outlines on the ground.

Mr. Watson—The conditions are all right as far as the surveyors are concerned.

A Member—Take the example of the government itself, that ought to be an example for us; they do not put all their posts in.

Mr. Fitzgerald—True, but their surveyors don't put a certificate on their plans.

The President—It seems to me that there are two questions now before us, one arising out of the other; there is a doubt among the members as to what the certificate really means, and there is also the question as to whether the surveyors should plant the posts at the angles of all the lots, before they register the plans.

Mr. Watson—There is another matter to which Mr. van Nostrand made reference and that is the matter of the Toronto Guild. There should not be anything invidious about that; I simply wanted to show that this Association was not doing that particular work. I would like to see more work and better work done here.

Mr. van Nostrand—I am very glad to hear that explanation and I am very well satisfied with it, I would like to know whether the suggested addition to the certificate was discussed yesterday which would make it necessary for the surveyor to show pretty clearly whether he had made a complete survey. If the Act requires the posts to be shown on the plans, that will affect a number of surveyors who are making plans for registration where no posts are shown. Often posts are planted by people who are not authorized to plant them; you may survey a piece of property now and in twenty years another survey is wanted, and some other surveyor comes across these posts. Who planted them? It has been discovered that a great many posts have been planted in Toronto and the vicinity by people who are not authorized, and there is a great difficulty in dealing with that matter. These posts are often very badly planted, and it has stirred up a lot of trouble for all of us. There are certain well-known plans and unless it is for a much respected client we will not touch surveys on them, for we know that it will take us just three times as long as we usually take to do the work and when it is done it is far from satisfactory; we do not want to trouble the Association with that end of it, but that is why we wanted the posts to be shown on the plans.

Mr. Watson—Doesn't the Act say that you have to show the posts that are planted.

Mr. Sewell—The Act says if any, they may be shown.

The President—Doesn't it say that if any posts are planted they are to be shown.

Mr. Sewell—No, it doesn't.

Mr. Dobie—I will read sub-section 4 of section 8. (Reads sections.) That is that the certificate that the surveyor has to sign goes on to say not simply that he has surveyed the land, but that he has done it in accordance with the Registry Act. I do not see that it is absolutely necessary for a man to plant any posts unless he likes.

Mr. Watson—If he plants any he ought to show them.

Mr. Dobie—It seems to me that it is desirable in every case to plant all the posts you can, but at the same time we must realize that it is sometimes impossible to plant all the posts. The difficulty is that in one place it says, "posts, if any," and the certificate says, and only says, that the survey has been made in accordance with the provisions of the Registry Act. It also seems to me that this is more than a matter of practise, that it is a matter of legal juris-

diction. I do not think that it will make any difference to the surveyors in Toronto if we do not get that ruling for a year.

Mr. van Nostrand—It seems to me that the remarks of the last speaker are the best support we could have for this motion. If that part of the statute is called to the attention of the authorities I do not see how they can make any other ruling.

The President—Suppose we leave it to our solicitor for the interpretation of that clause.

Mr. van Nostrand—I would include that in my motion that the motion of yesterday be rescinded and that our solicitor be asked to interpret that clause for us.

Mr. McEvoy—I have much pleasure in seconding that; I am an outside surveyor.

Mr. Fullerton—There seems to be some misapprehension on the part of the outside surveyors, and I do not see any objection whatever to the city surveyors forming an association of their own; they have a perfect right to do so, and I think that anything that they bring up here that is beneficial to them and does not affect us we have no right at all to oppose.

The President put the motion and declared it carried.

Mr. Stull—I would like to draw your attention to section 3, of sub-section 2.

(Mr. Stull reads section in question and draws plan on blackboard.)

We are to divide a lot in halves by a line midway between the angles of the lots. Take it in the case of an uneven lot where the lines run as shown; we take the middle point of the upper line and the middle point of the lower line and join them, but that leaves the two halves of the lots unequal in area.

The President—You have the same thing practically in a broken front concession; the north half of a lot may have 100 acres and the south half only 50.

Mr. Stull—The trouble is that the farmer comes along and he thinks he ought to have half the area of the lot.

The President—You can tell him he didn't pay for half the area. I think that section has got rid of more difficulties in one year than any other clause. Before if ten surveyors went to survey a lot no two of them would agree.

Mr. Routly—In the case of a survey made some years ago under some of the old systems, and you are surveying the adjoining lot under the new act, are you going to accept the old survey so far as it affects one of your new boundaries.

The President—I cannot see how that can happen; the law clerk claims that our amending act could not apply to any lots that have been already sold or patented. Take for instance a free grant lot; as soon as a man enters upon that lot it is sold even if he has not received his patent, our amending act would not go back to a lot like that.

Mr. Routly—I do not understand that any lot which has been applied for would be considered to be sold in that sense.

The President—No, I won't say applied for; I mean sold or patented.

Mr. Routly—Take, for instance, some of the Porcupine mining claims; some surveyors think that the middle line between the north and south halves should be on the mean bearing between the north and south boundaries. I can easily see that a line cutting that lot into equal areas might not touch the points in the middle of the boundaries. Any surveyor going in to make a survey under the new act cannot help but conflict in a case of that kind.

The President—If neither parts are patented.

Mr. Routly—Well, you conflict with the old surveys if you abide by the present act; you have got to do one thing or the other; the present act is certainly much easier to work under, as applied to new surveys it is quite simple, but when you conflict with old surveys I am not quite positive as to what should be done.

The President—As soon as a surveyor makes a survey he files a copy with the Recorder. I think that that survey when made and filed with the Recorder would hold good so far as it affects the balance of the lot and I do not think that any change would be accepted by the Recorder if the new survey encroached on the other, but I would not like to give an opinion.

Mr. Routly—I would like to show a case in point; suppose a dividing line was run between the north and south boundaries so as to divide a mining claim into equal areas. Suppose another surveyor comes in under the new act and he finds 41.50 chains in one half of the boundary and 43.50 chains in the other. He measures to the middle and runs his line; at one end he leaves a gap and at the other end the two surveys overlap. When are we to apply this new revision literally and when are we not?

The President—Was it all staked before the act?

Mr. Routly—Yes. There is an infinite number of variations that might come in. I do not know that that has any bearing on it.

Mr. Dobie—Suppose the old survey was patented under the old act; you would absolutely be bound by it.

The President—Oh, yes, but this is a case where no patent is issued. If the old portion was patented before the passing of the new act and the balance subsequently, and this line would come down here to the centre, there would be a gore left in there. (Showing.)

Mr. Speight—There is no doubt but that the new section has not expressed itself quite as clearly as we might desire. It seems to me that this case that Mr. Routly brought up is a very good one and likely to occur very frequently in the north country. Probably a reasonable opinion would be that where a survey has been made before this act came in force that the new act is not to apply; then, if that is so, in such a case as this, the new act would not apply.

Mr. Shaw—I think, Mr. President, that under the circumstances where the north half has been patented and a surveyor is called in under the new ruling to lay out the part south of that that he would be justified in leaving the gore, and that if there is an overlapping at the other end that he should not include that in his description, that it is already patented.

The President—Suppose this was patented.

Mr. Shaw—Just leave the gore.

The President—It would be patented up to this line.

Mr. Routly—Supposing it has just been surveyed but not patented. As far as that is concerned the patent and the survey have no very definite relation to each other; the patent is issued for a certain quarter of a lot and it is a matter of finding that quarter. If a man has a patent for the northwest quarter of the south half, and a new surveyor goes in to survey the south west quarter under the new system it would conflict, and what are you going to do.

The President—If the plan forms no part of the patent it counts for nothing, for the plan is only filed in the department and there is no mention of that survey in the patent; it has no bearing in establishing the lines.

Mr. Stull—Supposing a man had a patent for the whole lot and he sells the east half of the lot, how would you then divide it.

The President—That is a legal question.

Mr. Stull—Would you subdivide it by the new act or by half the area.

The President—I think you would subdivide it by the new act.

Mr. Stull—It was patented under the old act.

The President—I think he has sold a half a lot according to the act in force when he sells; I would be inclined to think that the new act would apply.

I think our solicitor is probably the best posted man in land titles, and I think this is a question that would be well worth while submitting to him, as to what a surveyor ought to do now when subdividing a lot that was surveyed previous to the passing of that act, and whether the old or the new act would apply.

The President—If he conveyed it as an aliquot part then the new act could not apply.

Mr. van Nostrand—Does not the date of the patent have some bearing on it? If it was before the new law then the line must be run in a certain way; it does not come into the same class as the astronomical surveys that have been referred to.

The President—Are there any further questions; if not, I would ask Mr. Speight to take the chair.

The chair was taken by Mr. Speight.

Mr. Whitson—A matter has been referred to the Department with reference to the survey of mining claims in the new districts, as to what information a surveyor should be expected to acquire and show on his plan and field notes. A series of complaints were made that surveyors often leave off information which should be shown on their plans and by their leaving off this information the mining recorder is often misled and grants certificates where they should not be granted. I would like to read an expression from the mining commissioners' report; I do not know who the surveyors are; they are not mentioned here. (Reads extract from Report.)

I thought this matter ought to be brought before the Association to-day; I understand that there is likely to be legislation passed whereby no surveyor can make a survey without a permit from the Recorder. When a surveyor is out making one survey and he meets

a prospector in the woods, and is asked at once to make another survey, if he has to seek out the Recorder's office, it may be 50 or 100 miles away, it might be a very serious matter. I would like to get an expression of opinion from the Association on this matter.

The Chairman—It is open for discussion; it is a very important matter and I hope to hear your views.

Mr. Routly—I think I am more or less familiar with the case at issue.

In this particular case a very special effort was made to find the first prospectors' posts, and we were forced to report that we could find no conflicting lines; and if the mining Commissioner will examine our plans he will find notes on the descriptions that the ground was staked, wholly staked or partially staked, on the ground at the time. It is our invariable rule to give that information. It is held by some surveyors that we are not bound to do that. I do not think there is any thing in the Act that compels a surveyor to search the whole country for conflicting lines; I do not think it could be shown to be reasonable that we have to hunt over the whole country to find all the claims staked. You make a survey of a man's claim as it stands and then if a man has a claim that he feels conflicts with that it is his duty to have a survey made and lay the whole facts before the department. I hold that it is absolutely unfair for the mining Commissioner to make the surveyor responsible where there is any conflict.

Mr. Code—As I understand it this is a case where a surveyor goes out to survey a claim, and he includes as part of this claim on his certificate something that is already granted. Might I ask Mr. Whitson if that claim was surveyed.

Mr. Whitson—The first claim—no; the first claim that was staked did not receive a certificate of record; the second claim that was staked was the first to be surveyed, and as soon as the survey was made the owner applied for a certificate of record and got it because there appeared to be no conflicting claims.

Mr. Code—I really think the Recorder has gone out of his way in granting a certificate record.

Mr. Whitson—I am a little surprised at Mr. Routly not making a very careful survey as we find is his almost invariable custom. Assume for the present it was Mr. Somers his partner; Mr. Somers gave this certificate and handed it over to his client, and his client proceeded to the recording office and filed his plan and got his certificate of record.

Mr. Code—I find that in a great many cases there are prospective lines, six, eight, or ten, running in all directions; it is our custom to follow these lines up, hunt them up, and give all the information we can; should we find any conflicting claims in our survey we still mark the posts which our client asked us to do.

Mr. Whitson—If you go to the recording office and you find that a claim has been recorded somewhere in your vicinity; you find No. 1 post and you cannot find No. 2, or three or four, don't you feel it to be your duty to give that report in to the mining recorder so that he won't de deceived in giving a certificate for No. 2 claim. That is the case in point the surveyor had all the information that it was possible to get from the recorder and he was aware that there was a claim in that section that probably conflicted with No. 2.

Mr. Code—I really think that the surveyor should report these circumstances to the recorder before filing his plan.

The Chairman—I think that is the custom.

Mr. Code—I was talking to a gentleman the other day in Swastika who found two or three No. 1 posts on the one claim; it is very hard indeed to follow some of the lines. I also find some prospectors in running lines place three posts, which they should not do. During the last few years wherever it is possible we always go to the Recorder's office, and get what information we can and make our survey, and after having made the survey and having had the information, we try to get it right in some manner before filing the plans, but in general you can connect it by following up the posts.

Mr. Dobie—It seems to me that a surveyor cannot do anything else but join No. 1 and No. 2 posts. There is nothing in the act as far as I can see authorising anything else.

Mr. Whitson—If you are surveying No. 2 claim of course you join No. 1 and No. 2 posts; you would not blaze the line, for there is a portion of that line that is altogether in the other claim.

Mr. Dobie—What authority have you for saying that?

Mr. Whitson—You cannot take in any adjoining claim in your plan. In order to make a survey of No. 2 claim you have first to run the west boundary of No. 1, and find out if No. 2 takes in part of No. 1. There is nothing definite in the act about that system of surveying.

A Member—I think the usual way is to join the posts on No. 1 claim without reference to No. 2 claim.

The Chairman—Either is accepted by the Department.

Mr. Whitson—From what Mr. Routly states that it is not the duty of the surveyor to look up these lines, then it puts the Recorder and the Department in a rather peculiar position, and there would be no end to the litigatioin, and that is the question that I would like discussed, whether the surveyor should make diligent search for conflicting claims, or should he just go to the prospector who points out the posts of the claim that he wants to have surveyed and draw a straight line between them.

Mr. Routly—Well, I feel I was right in the statement that I made before, that there is nothing in the act to compel a surveyor to search all through the woods and go over a great mass of claims. If a surveyor goes on the ground to make a survey of No. 2 claim; he joins up his posts and he finds No. 1 claim on the ground; he has no means of knowing anything about it unless he has a map of the township, and even then there is a great deal of the country that is not mapped at all yet. How is a surveyor to know that there is a No. 1 claim in good standing; he may find half a dozen claims; how is a surveyor to know that there are any of them in good standing.

Mr. Whitson—If you look at the marks on the corner posts and on the discovery post you will find that all out. Wouldn't you think it was your duty to go to the Recording Office and see whether any of such claims were in good standing or not. If they were in good standing you should surely consider it your duty to amend your survey.

Mr. Routly—In the majority of cases it is impossible to read what is on the posts. Poplar blackens in the spring and the spruce comes out, it all sloughs out with a dirty slimy stuff, and you find that a great many of the posts cannot be read at all. Suppose I am called over to Bristol and you know the whole country is staked full of claims; there might be ten or fifteen claims recorded and the surveyor goes in there to make a survey, and even if he searched all the records he would be supplied with a very small percentage of information, and if he went on the ground and made a search of every claim recorded you would still have only a small amount of information; you could not tell whether the claims that you considered conflicting were in good standing or not, whether they were recorded or whether they ever would be recorded.

I for one am very willing and always have furnished the Recorder with the fullest possible information. In this particular case I have no hesitation in saying we made a careful search at the time. What is more, the man who owned these claims was in there after we made a survey; he reported his 120 days work, and he went right to the Recorder's office and reported his 120 days, and he said nothing about any lines across his claim at all and he never came to us about that. That was the very thing that removed the last shred of doubt in my mind; we could not get in touch with the man himself; we could not find the man that owned this claim but we found out later on that he recorded 120 days' work on this claim. He made no complaint whatever and said nothing about his claim being cut up by our surveys; he was very anxious about it, much more anxious than the surveyor; we were quite certain that we were right according to the way the man had the claim recorded. There are a number of claims recorded on certain ground that may be a mile away, and the certificate shows where they are when the certificate of record is granted, but the fact that they conflict on the man is no evidence that they conflict on the ground.

Mr. Whitson—Was there any work on the ground?

Mr. Routly—There was four feet of snow, and besides there was no evidence whatever, and the ground was staked by three or four parties; there was no evidence on the ground that could be found, and when the owner of the ground came in and recorded 120 days' work on his claim, and we knew that, we felt that his claim must certainly be some place else; it was his duty to complain if he found the lines?

Mr. Whitson—He may have been working on another part of his claim and not have seen your lines at all.

Mr. Fullerton—I think there is some ground for the complaint of the mining Commissioner, and I think Mr. Routly is unfortunate in having to go out at that season of the year. I do not see that the burden of it really falls upon the surveyor by insisting that it is his duty to survey that claim and to define conflicting claims but if the price of surveying mining claims has got down so low that it will not cover the cost of supplying that information then it simply means that the surveyor must get more for his work, and the man that has to pay the additional cost of that, is the owner.

The man that is getting claim No. 2 surveyed very often goes out on the ground and points out the posts, but there is nobody

who can point out the posts on claim No. 1, and in the depth of winter it is a very hard thing to even find the posts.

I was engaged to survey a claim and after much difficulty I found a claim that I thought conflicted and I immediately stated the circumstances to the Recorder and told him not to grant a certificate on that claim; the same evening that I finished work I sent in that letter, and in spite of that the mining Recorder granted a certificate of record on the first claim; the first surveyor did not report that this claim was staked twice. This is a case where both the surveyor and the mining Recorder were at fault, for the first surveyor never reported that there were conflicting stakes.

Mr. Whitson—The first surveyor never looked at the posts at all; he admitted that.

Mr. Fullerton—Of course, a man cannot search over the whole township.

Mr. Whitson—He has not to search beyond the limits of the land he takes in.

Mr. Fullerton—As Mr. Routly says it was shown in a very different place.

Mr. Whitson—I do not know that that is the same case that Mr. Routly tells about.

Mr. Stull—The usual custom is to go out and make the survey of the claim, and if there is any dispute let them fight it out; we are not going to take the responsibility of having to go out into the woods and having to go and search the recording office; you would be making two or three trips before you would get your work done. If there is any conflicting evidence on the ground you take a note of it but you cannot always tell then. I know cases of where claims have been surveyed, at least, staked out where a man would cross a line a hundred times and not see a blaze, probably there were a few gaps cut and no blazes marked at all; how would you know any thing about that in the winter time; you would never see it; a man goes back and makes his survey and he finds that his line conflicts with one already on the ground, we would be willing to have our surveys changed if it was found that they were in error.

Mr. Whitson—There is no notice given to the other claim owner; you get your certificate and you probably get your patent.

Mr. Stull—There is nothing in the act whereby we have got to give any information whatever to the Recorder.

Mr. Whitson—You have to file your plans.

Mr. Code—I was asked to go down in Shaw township and make a survey, and I asked the man if he knew the posts and he said Yes, that he had bought this claim. I went down to the claim and I had a pretty hard day's trip of it; he was not there but I found him after a while, and we found posts one and two all right, but three and four we could not find; I had a copy of the application in my pocket and he says I can show you these, and we found them three or four hundred feet from where they ought to be; however he showed them to me and they were probably 21 or 22 chains apart, and I showed him where his application called for only five chains, and I told him I would do nothing until such time as he brought the man that staked the claim and then I would make the survey. In the meantime I have to sue the man for the fees for my trip.

Mr. Stull—You are heaping up a whole lot of trouble when you start prospectors out to run lines; as you say, you have posts all over; you may have a copy of the original application but it is no more like what the claim is on the ground than night is like day; I think that we should have the act amended in this way that the man who staked the claim should be compelled to go with the surveyor.

Mr. Whitson—That can't be done.

Mr. Stull—You are going to have difficulty then.

Mr. Whitson—If you know the claim is staked probably the best way is to search the office, and if the claim is in good standing notify the adjoining claim owner.

Mr. Stull—You find a claim and bunched right round it is a series of other claims; you go on the ground and you find it; you may find that that claim is off by itself or surrounded by another entirely different group of claims.

Mr. Whitson—That is quite true, but if we take the ground that you take then the Department simply has no means of knowing anything about the claims that you send in.

Mr. Van Nostrand—If we look at the oath of a surveyor he pledges himself to faithfully discharge the duties of an Ontario Land Surveyor, and to faithfully discharge them he must give all the informatiion that he has that affects the interests of the public,

of the owners, of the parties interested in adjoining claims, and of the mining Recorder. He is under an obligation to supply the Recorder with all the information that is necessary to the title of the lands with which he is dealing. If he faithfully discharges that duty without favour or prejudice, I do not see that the Recorder has any ground for complaint. If it can be shown that he has not done so, the onus is on the surveyor.

Mr. Routly — The request is that these conflicting lines be shown on the plan.

Mr. Whitson—Or some notice given; if you have any knowledge of a dispute it should be your duty to see the Recorder and point out what you have found out so that he would be put on his guard.

Mr. Routly—I hold that this is gratuitous work, but it has been our invariable custom to do so. Suppose a man calls on you to survey a claim, and you find a conflicting line, and your client says, I am going to fight for that; I want this claim surveyed as I have staked it. He says perhaps that these other fellows have jumped their claim or haven't done their work. I do not see that the surveyor can do any thing else than survey the ground and show it on the plan. Suppose I show all these other claims that are said to conflict by the use of colored inks or hatching, and when I get through the Mining Recorder says, I don't want all this; there are numberless lines that you will find on some claims that have no bearing whatever. My practise is on the description sheet to make reference to those claims that have been staked giving the numbers and the date, and so on, and I hold it is up to the Mining Recorder to search up whether that claim is in good standing or not, not the surveyor, for we have not got access to his books. If we get all the information about this staking that we can, then it is his duty to see if these claims are conflicting claims.

Mr. Whitson—You make your plan and you find a record number, say M. R. 456. What is M. R. 456; if it takes in any part of your property the act says that you can only stake a claim where it is not already patented and if that claim takes in patented land it can't be staked.

Mr. Routly—That is altogether another question. I do not know that the claim is in good standing; we always show it; but it is quite a different thing to show that it is in conflict with our client's claim.

Mr. Whitson—I think that a surveyor that signs a plan that does not show these other claims is certainly deceiving the Mining Recorder.

Mr. Routly—Supposing you find a lot of old claims and you cannot find any one of these stakes. I think a great deal of this trouble is due to the Mining Recorder Department; there have been claims staked for the last eight or ten years and legislation along the lines of insisting upon priority of prospect of the property staked has been very lax. It seems to me that there should be some regulation regarding staking so that the stakes should not only be legible when they are put in but should remain legible. It is a heart breaking job to walk miles and miles through heavy snow to find claims staked and you cannot read what was put on them; then a great many claims are staked with birch and if the birch is cut in the winter time you cannot read anything on them. It is time that the Mining Department issued regulations calling for a little better staking. I think you are aiming at the wrong man; I know I have had claims where there are eight or ten pages of field notes; in every case in my practice where there has been trouble we have found that it has been due to the fact that the staking has been done in a very careless fashion.

Mr. Whitson—I would not like to take a vote on this; I hope we are all doing what we can; I would rather let the matter drop; I would not like to see the act changed as they propose changing it; I think it would be a very awkward thing for the surveyor if they had to get permission from the Recorder before making a survey and have to notify the adjoining claim holders. I think if the thing was given to the Department as it has been expressed here, that that would certainly be the result and I would not like to put that motion. I think there is no doubt that the surveyor in the future will be bound to get permission from the Recorder, and if there is any doubt at all notify adjoining claim owners. I was surprised to hear the opinions expressed by Mr. Stull that he thought it was not incumbent on the surveyor to make any search at all.

Mr. Stull—What I intended to say was that you should make what search you can, that is, if you find any conflicting lines; there are cases where you cannot; where you do not find them. There are cases where you go out to survey a claim, and the man takes you out to it, you make a survey of it, and you have the description from the Recording Office with you; there are no markings on the posts that you can see; you are morally positive that the record number is a certain one, say M. R. 456, but you may find that the claim is in an entirely different part of the township, and you have got to take the man's word that staked the claim.

Mr. Routly—I would like to ask Mr. Whitson what is his view.

Mr. Whitson—I was always under the impression, and I think I am right, that the surveyor should make a diligent search for conflicting lines.

Mr. Routly—That is quite right.

Mr. Whitson—If there is any question of doubt you should call at the Recording Office and verify anything like that. I had no idea that any surveyor would take the ground that they should pay no attention to the lines that cross the claim they are working on.

Mr. Routly—I think if you examine the plans I filed that you will find these plans are refutations of any such charge as that. I would like to ask that if any legislation of this character is contemplated, that the Council of this Association should be in touch with it and before legislation of the nature expressed by the Mining Commissioner is passed, that there should be a commission of investigation, embracing surveyors, prospectors, the Mining Recorders and the Commissioner to go into the question and devise equitable legislation, giving us a chance to show our views, before drastic legislation such as this is put into effect.

Mr. Whitson—Under the Mining Act the Commissioner or the Minister can make any regulations he likes in reference to surveying, without an Act of Parliament. He can make a regulation that notice shall be given to the adjoining claim holder, without any legislation at all.

Mr. Routly—If that is the case, why is it that the Mining Department have not long before now issued an order in Council that the surveys shall do this. I have never been able to find that any order has been passed fixing any definite action.

Mr. Burwash—If you take the law as it is in British Columbia, and you go out to make a survey you are required to make a blue print of it to hang in the Recorder's Office and it has to be advertised in the newspapers for 60 days, then the adjoining owners have a chance to get into communication with the Department; that protects the prospector and the surveyor.

Mr. Whitson—It is very convenient for the prospector if he meets the surveyor in the field.

Mr. Burwash—After he surveys the claim the plan is posted in the Recorder's Office for 60 days, and it is also put in the newspapers, and if anybody puts in a claim before the certificate is granted, the matter has to go before the Mining Commissioner.

Mr. Dobie—That should be done in the first survey anyway; then you would have something tangible to go on.

Mr. van Nostrand—Is it necessary for a motion to give a concrete result to this discussion? It might be done now in the report and the report could be adopted later on; it is so difficult to get a resolution in a general meeting in proper form for publication, so that those who do not attend the meeting will know what is being done. Is there a motion necessary in connection with this?

The President—No, just the discussion.

Mr. Whitson—I move the adoption of the report of the Committee on Land Surveying, and whatever result is arrived at from this discussion it can be dealt with later on.

Mr. van Nostrand—I second that; I did not know that Mr. Whitson was in the room.

The Chairman put the motion and declared it carried.

PAPERS.

(This Association is not responsible as a body for the opinions expressed in its Papers by Authors.)

RIGHTS OF WAY.

BY D. D. JAMES, O.L.S., TORONTO.

I am not expecting in this paper to give any analysis of this subject but to record experiences and points of view which have come to me in practice as a surveyor.

One's ideas as a young surveyor or as a technical graduate get greatly modified by experience in this matter.

The young surveyor may consider that the measurements obtained for a right of way plan should be equally exact and he feels sometimes very anxious to get all of them faultless.

Later he finds that some chief engineer of a railway also an O. L. S. certifies to plans the accuracy of which, from a practising land surveyors' point of view, he has no real check. Important ties have been made by rodmen and axemen under orders from resident engineers, who had slight ideas as to the use of it all.

It is all to them the satisfying of irksome regulations of the Government and though it may keep some of the men out of mischief in a slack season it is to him on the whole a troublesome task perhaps illustrative of this theory that chainmens' work enhanced by an O. L. S. certificate gains thereby 1,000 per cent.

This picture, however, is more true of the past than the present. The more we honor our work and maintain the truth, that a surveyor in practice gains instincts of value in appreciating evidence on the ground, the more outsiders will also be convinced of our worth.

Such considerations bring us to the question what a surveyor should do, when supplied with centre line notes, which he knows are usually the result of painstaking and careful measurements by a party of engineers.

From a surveyor's standpoint the areas of land taken and the ties of the lot corners are the most important. Since the chief engineer signs the Right of Way Plan, he cannot blame the surveyor if the centre line should be erroneously placed on account of some confusion, the surveyor having had no notice of a changed location.

After taking ties and observations for azimuth say 10 miles apart and knowing the measurements of the original farm lots passed through, the surveyor can pretty well tell whether he is safe in accepting the centre line notes.

If the land is valuable it will be probably near a settlement and in small pieces which will be easily checked, centre line notes and all by actual measurements.

Now a right of way plan, conscientiously treated, will be the means, as all surveys should be, of recording and perpetuating corners and corner posts which may be otherwise lost. The fact that a right of way is needed in a neighborhood makes that neighborhood more important and it is fair to assume that at least those old posts and marks that do exist, having been once found and tied in, also any well established and checked fences should be marked on the Right of Way Plan and subsequently, and which is really more important, marked on the individual tracings for deeds. In my work in connection with old right of way I have found such old notes invaluable and in our modern many methods we seem likely to forget such things. A theoretical line shewn on a plan inspires me often with dread, but once humanize the line by some as it were, personal remarks and it seems to be an old acquaintance and interest is aroused at once and also a confidence that someone in the past has puzzled about it at least a little and concluded to place it and confirm its shewn position.

I have heard engineers complain of the amount of work that the surveyor does (sometimes does), I have heard indignant protests that said surveyor is surveying the whole neighborhood at the expense of the company. This reminds me of the would be client with his 20 foot lot who demands it be staked out and offers the big price of $3.00 just for driving the stakes, innocently intimating that a surveyor's graft is one that is hard to touch.

These people do not recognize that there are no regular taxes expended upon the upkeep of boundary marks and that it is fortunate for the community that surveyors are interested enough to take pains to reconcile as nearly as possible all information reason-

ably attainable, and through an intelligent grasp of the situation to be beforehand to prevent ignorant claims to be set up, with consequent legal tangles.

I am of the opinion that the narrowing of the practise of land surveying to a special body of men has been of more benefit to the country at large than even to the body of men themselves, and that the latter are only just waking up to their value and to the fact that a surveyor must not work every night even if it interests him to do so. He must not pay too high a price for his specialty; he must study and read generally and have advanced views of politics, religion, sociology, as well as professors, preachers and lawyers.

After this slight digression I would remark that even if individuals become less selfish and less anxious for their exact boundaries, method and order require that surveys shall check with one another, and in close centres economy demands that there shall not be spaces left in consequence of Alphonse and Gaston quarrelling as to who shall lose a doubtful foot of title.

A class of right-of-way survey rich in tangles is one for canal or water power development. Now in right-of-way work it is necessary to furnish the property owners' names as found on the ground. But here the greatest variety of titles is encountered, comprising riparian rights, rights to land covered by water, rights to use the water for power purposes, rights to navigate even in rapids, and rights to land and use the shore for drying nets.

Perhaps someone has developed power in the past, built a dam and covered over with water some land originally attached to and part of the land of the original lot. Some obliging surveyor perhaps in this case too much interested in some form of social study not associated with water, is required to subdivide the land in the neighborhood. He shows his lots butting on the river or power pond as if it were the original river margin.

Later the dam breaks and the pond goes down. Still the plan performs the same service and is supposed to reach the water's edge, and conveyances are made in utter indifference of changed conditions. Or this can occur: A subdivision is made at a date when the river was in its original state. Subsequently the water is dammed back over the land. Still the plan is good enough for all purposes, despite the fact that the owner of the pond has had to buy some strips of land farther up stream because he has flooded them. He later conveys by his own old plan, unthinkingly taking the lot as extending to his flooded margin.

Problems like this occur.

What is the correct area to give to an owner who holds to the water's edge? We search the title and find that the original owner of the power development gave deed after water was raised on the river bank. If we try to make something from the registered plans we find their water lines all agree most accurately, but the fact remains that some were made before the flood, while others were made after it, and they should not agree.

Supposing we rest in the belief that it is unreasonable to suppose that the pond owner parted with flooded land. Later we are brought up short with a building butting into the water over this land. We must then hedge and say that the owner has a possessory title and all goes well. Then comes along a promoter, perhaps with some legal advice, saying you can't squat on a water power. That gives one a turn. But perhaps the building allows for a passage of water under it. So we reassure ourselves and say we have only sanctioned a squat on land under a water power, or, really, it is on the original river side. Then perhaps the matter is ready for the real estate buyer to be turned on. He is then running between owner, lawyer and surveyor for several years, and has a merry time. Descriptions and individual plans are required in a steady stream, and at last everything is satisfactorily settled.

Perhaps a little later a change of government finds that it will cost more to finish this piece of public work than it will ever be worth. Then we feel glad that we did not know it the time we were doing all that thinking. I found it of great importance to read the patent from the Crown in all cases affecting water. These cannot be obtained at the registry office, but are to be found at the Provincial Registrar's office.

In some old patents rivers 200 to 400 feet wide are included in descriptions by metes and bounds as if no river existed.

Some patents give block or lot acreages, perfunctorily stating with all the woods and waters thereon lying.

Other patents are modified by clause such as "saving navigable waters" or "saving the waters of the river," or reserving the right to land for all vessels, boats and persons.

Even when one feels sure of the right interpretation of the patent the difficulty may not end. Some successor in title feels so little his proprietorship that he conveys his land with no mention of any and sundry rights mentioned and involved in the patent

from the crown. In simple cases of unnavigable water I believe the owners of opposing banks get half way across, or each can control half the water power developable opposite this holding. Such rights are sometimes called riparian rights, but against this view we come across sundry views such as this, that riparian rights only include the use of the water for farm purposes. This view looks somewhat reasonable, and in view of socialistic tendencies may be developed in the future. For if the contrary were true, that the public has no rights but that of having the water pass that way, would we not be progressing to the point of view that aeroplanes were trespassing on private premises continually, for I believe the view is that private property in land extends to the stars, and farther if occasion arises.

It seems that views that were highly theoretical in the past might be made more finite and in favor of those persons who have a use for the unvalued and undetermined parts of titles. I may further note that a knowledge of the patenting of land under water or of how land is patented that borders on water is necessary to reason as to ownership possible by the Statute of Limitations.

Descriptions are a very important matter in the right-of-way work. I think there should be in these in case of a railway a mention of the located right-of-way, thus making it clear that it is as it were staked out and that the railway centre line is as it were an original line and cannot be subject to any movement. The centre of the track will remain reasonably the same so far as farming lands are concerned. Of course near towns there will be smaller parcels, which may tie in the original surveyed centre line and show an actual change or shift of line from the first located centre line, but I have never heard of much trouble arising. In the case of irregular parcels, as in canal right-of-way, the surveyor should actually stake out or monument the parcels, show the stakes and any other reference and marks on the individual plans. The descriptions should here also refer to these stakes and marks, so that it is evident that the same are as original marks or stakes in a plan of subdivision. This manner of describing insures that the parcels must be located as intended in spite of any inaccuracy in a tie for the point of commencement.

I have a few copies here of plans illustrating a right-of-way re-survey which may be of interest. The railway undertaking this work spent a large amount checking up their property obtained under different charters. They incidentally saved on their assessment by means of the surveys and plans. After survey and examination of deeds the centre line was fixed by stone monuments 1,000

feet apart. The centre lines were re-assumed from properly checked tracks. Tracings were made showing all the fixtures of the road, which were called maps. Land plans covering the same ground were also made. These gave the deed information shortly and an assumed filing number for the deed. Black and white prints from these tracings were colored up and the whole bound into atlases, of which there were quite a few copies made for the different railway offices.

Discussion.

The President—This paper is now open for discussion. Are there any questions that you would like to ask Mr. James? I am sure we are indebted to him for this paper, and it would be well if the surveyors would follow out his suggestions.

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CANADA'S MINERAL INDUSTRY.

BY WILLET G. MILLER, PROVINCIAL GEOLOGIST.

Having, at the request of the President of this Society, consented to read a paper at this meeting, it seemed to me that a suitable subject would be "Canada's Mineral Industry." The profession of surveying and the mineral industry are closely connected. The surveyor not only determines the boundaries of the original claims or locations, but when mining progresses he locates the routes of highways and railways and does important work underground. He prevents the miner from running circular drifts instead of straight ones. He also keeps him from trespassing on neighboring properties. In fact, mining could not be pursued, on a large scale at least, without the co-operation of the surveyor.

I shall deal with our mineral industry briefly under three heads—Past, Present and Future.

Until the last two decades the mineral industry in Canada made but slow progress. A number of reasons may be given for this. Among these are: (1) The fact that the great majority of our early settlers knew nothing of minerals and were interested almost entirely in agriculture and lumbering. The belief grew up that Canada was not a mineral country. Investments in mines that were made by Canadians were then chiefly in connection with foreign enterprises. (2) The character of our population being what it was, naturally poor or absurd laws and regulations would be put in force by our legislators. For instance, the first mining regulation in Ontario, introduced in the forties, required that a mining claim should consist of not less than 6,400 acres. Of course such a regulation discouraged prospecting. Lands that were taken up, in the majority of cases, lay idle. A number of most promising areas have lain dormant ever since. The size of the claim at the present time in this Province is 40 acres. It is only within recent years

that the older provinces of Canada, at least, have given more intelligent and sympathetic attention to the industry. (3) It is only within the past thirty years that attention has been given to technical education. The fact that there were few technically trained men among Canadians in the past delayed the progress of the industry, but during the last two decades three mining schools at least have been developed that are sending out a comparatively large number of well-trained men, who are making their opinions felt in connection with the development of our mineral wealth.

Statistics.

In order to show the rapid progress that the mineral industry has made during the last two decades, I would draw attention to the following table:

Year.	Production.	Per capita.
1890	$ 17,000,000	$ 3.50
1900	64,000,000	12.04
1910	107,000,000	14.26

I have given the annual production in round numbers. It will be seen that, although our population has been increasing during these two decades, the mineral production per capita shows a much greater increase. Compared with twenty-five years ago, we find that the value of the mineral output now is about 10½ times what it was then. In 1910 the metallic substances were equal to 46.28 per cent. of the value of the whole mineral production; coal and other non-metallic substances make up the balance.

It may be of interest to show the relative standing of the leading mineral producers among the provinces at the present time. Some years ago it was a common saying that the central provinces of Canada—Ontario and Quebec—must depend almost entirely upon agriculture and lumber, while the western Pacific regions would be the mineral regions, but during the last ten years Ontario has come on rapidly. While the provinces bordering on the Atlantic and the Pacific are producers of coal and Ontario has no economic deposits of this mineral, still she leads all her sister provinces in the value of mineral output, as the following table shows:

1910 Mineral Production.

Ontario	40.76 per cent.
British Columbia	22.92 "
Nova Scotia	13.29 "
Alberta	8.42 "
Quebec	7.74 "

Alberta's coal production has recently caused her to take the lead of Quebec. The mineral production in New Brunswick, Manitoba, Saskatchewan and the North-West Territories has not yet reached large proportions.

Relative Standing of Industries.

There are essentially four industries that are based directly on natural resources, namely: agriculture, mining, fisheries, and that of forest products. Agriculture is, of course, by far the most important; but it is at times felt by those interested in mines that the position occupied by the mineral industry is not understood by the public. For this reason it sometimes does not secure the consideration and attention it deserves. Owing to the so-called wild-cat methods that are at times employed in connection with the flotation of mining companies, many people appear to believe that the industry as a whole is scarcely legitimate. However, we know, "that the best apple tree has the most sticks under it." Hence it is only natural that the mineral industry which offers such great inducements in this young country should attract to it people who employ disreputable methods. The true standing of the mineral industry should be gauged from the value of the output or what it adds to the wealth of the country.

While the per capita output of our mineral industry is only a little over $14, that of the United States is about $25. Judging from the progress that has been made in our industry during recent years, it should, in the not distant future, have a per capita output equal to that of our sister country. To illustrate the relative importance of the mineral industry in the United States, I might say that it has been estimated that a typical or average 1,000 ton trainload of freight in that country is made up as follows:

531 tons of mineral products
148 tons of manufactures.
112 tons of forest products.
109 tons of farm and ranch.
40 tons of merchandise.
60 tons of miscellaneous.

Character of Our Mineral Output.

While the value of our output per capita is not so great as that of some other countries, it may be of interest to note that it is characterized by what may be called uniqueness and variety. No country with the same, or approximately the same, population as Canada produces a greater variety of mineral substances. In connection with some of these minerals Canada controls the markets of the world. For instance, the asbestos deposits of Quebec supply about 80 per cent. of the world's consumption of this unique and useful substance. Then our country supplies about 65 per cent. of the metal nickel, having only one competitor in the production of this metal, viz., New Caledonia, in the Southern Pacific. Nickel may be called the metal of defence, since it is now used by all the navies of the world in the manufacture of armor plate. Our nickel production is likely to increase very rapidly. One of our two important producing companies is arranging to double its output. Then we produce another metal, or its compounds, that is closely related to nickel, namely: cobalt. This country absolutely controls the cobalt market, most of the foreign mines having to be closed since the metal was discovered in Northern Ontario. While silver is not a unique or uncommon metal, it is interesting to know that Canada stands third among the countries of the world in its production, Mexico and the United States being the leading producers. Then there are a number of minor minerals, such as corundum, feldspar, and so forth, of which Canada possesses the most important deposits.

The Undeveloped Resources.

Considering the vast unprospected regions of Canada, and knowing what similar series of rocks have produced in other regions when development work has been done, we can say that our mineral industry is as yet only in its infancy. Fully one-third of Canada is a prospective mining field and nothing more. If it does not support a mineral industry it will be practically valueless.

It has long been recognized that the Canadian territory along the Rocky Mountains and the Pacific Ocean is a promising mineral field. The continuation of this mountainous region southward through the United States and Mexico is one of the world's greatest mining regions. The mountains in Mexico have an approximate length of 1,700 miles. In the United States their length is about

1,300 miles, and in Canada 1,600. It is estimated that the value of the production of the precious metals for each mile in length of the mountains in Mexico has been about $3,500,000, and in the United States about the same. Should not the Canadian region of similar character be considered of great promise as a mineral field?

But there is another vast Canadian territory which promises as great, or greater, returns from mining than does the region on the Pacific. This region is indicated on the accompanying map of North America as the region of the pre-Cambrian rocks. It will be seen from the map that areas occupied by these rocks are of comparatively small extent south of the Canadian boundary line. Since mining in Canada has been based largely on the experience of the United States in this industry, it is not to be wondered at that little attention, until within a comparatively few years, has been paid to the mineral possibilities of our northern pre-Cambrian regions. If we consider, however, what has been the result of prospecting and mining development on the southern edge of these regions, near the centres of population, we must admit that the more northern and at present almost inaccessible regions containing similar series of rocks, contain possibilities of vast mineral wealth

The comparatively small part of these pre-Cambrian regions which crosses the boundary lines and occupies parts of the States of Michigan and Minnesota south of Lake Superior, has been proved to be a wonderful ore-bearing district. The iron deposits of Michigan and Minnesota which occur in these old rocks have caused the United States to lead the countries of the world as a producer of iron and steel. The copper deposits of Michigan are famous. Then in Northern Ontario, along the southern edge of the pre-Cambrian region, we have the Sudbury nickel-copper area, and 90 miles to the northeast the Cobalt silver deposits. Both Sudbury and Cobalt are the greatest mining areas of their kind. It is not too much to expect that, when the vast regions extending far to the northeast of Cobalt and Sudbury to Ungava, and when the still greater pre-Cambrian regions that extend to the northwest as far as Great Bear Lake and beyond, are prospected, numerous other Cobalts and Sudburys will be found. Indeed, it can be said that these great pre-Cambrian regions, which occupy one-half at least of the surface of Canada, are the most promising unprospected mineral areas of the world.

The regions both to the west and east of Hudson Bay will soon be made readily accessible to the explorer and prospector by the

GREENLAND
HUDSON
BAY
SUDBURY
GULF
OF
MEXICO
PRE-CAMBRIAN
AREAS

construction of the railway to Port Nelson, and probably by one or two lines of railway to the southern part of James Bay. Steamers will connect with the railways, and prospectors will be enabled to reach any part of the shores of this great inland sea with comparative ease. The natural resources of the Bay and of the surrounding region justify the building of the road to Port Nelson, even if it never carries a carload of grain.

Cobalt Area.

In conclusion, it may be of interest to say something of the mineral industry carried on at Cobalt.

In 1911 this small area of less than six square miles, which a few years ago was an unproductive area in the heart of the wilderness, had ten mines which each produced one million ounces or more of silver. Since the beginning of mining in the Cobalt district to the end of 1911 there have been produced 125,571,980 ounces of silver, which brought $64,317,352. The value of the production in 1911 was $15,949,019, and the dividends paid during that year amounted to $8,588,916, a remarkable record of dividends, representing over fifty per cent. of the value of the output. The total dividends since mining began are between thirty and thirty-five million dollars. In considering the dividends paid by the Cobalt mines it should be remembered that there are some producers that are either privately owned or are close corporations, whose annual profits are not published.

Cobalt not only produces great profits from the mines, but it has made the government railway, which was built practically for the development of the agricultural district of the north, a success. It has also attracted attention to Northern Ontario as a whole and has brought many more people to our northern country than would the more prosaic industries of agriculture and lumbering in many years. The Temiskaming and Northern Ontario Railway has cost something like fifteen million dollars. It will be seen that the dividends alone from Cobalt have been over twice this sum. Then there have been over thirty million dollars or more, received from the output of the mines, expended in labor and supplies. In addition to the production, the people, as represented by the government, have received large returns from Cobalt in the sale of lands and other revenue.

Considering the great richness of Cobalt and the ease with which the silver can be mined, it is an interesting speculation as to

what would have happened if the ores had been discovered during the French period. Silver in those days was worth more than twice what it is at present, selling for something like $1.30 an ounce; labor was cheaper and money represented more in other ways than it now does. Cobalt lying so close to Lake Temiskaming, a part of the great Ottawa River route, the rich ore could easily have been transported. The discovery during the French period might have changed the political complexion of the whole of North America. Either the French would have come over in such numbers as to have enabled them to hold Canada for a much longer period at least, or the New England colonists would have stampeded to the north and have taken possession of the land.

Other metals than silver occur at Cobalt, but unfortunately little is received for them at present. Cobalt is not only the world's greatest producer of silver, but it leads in the production of the metal cobalt, and stands third in the output of the sister metal, nickel. It is also probably the greatest producer of arsenic. The demand for the compounds of cobalt is limited, their chief use being as a coloring agent in the pottery and glass industries. The use in coloring glass was known in prehistoric times. Cobalt glass has been found in the graves of the ancient Egyptians and in the ruins of Troy.

Sudbury Area.

The Sudbury mining area has never been of such great popular interest as Cobalt. The reason for this is that Cobalt at the beginning was a "poor man's field." It required little capital to mine the rich ore. The owner of a good claim could soon pile up a bank account. On the other hand, not only does it require large capital to carry on the industry at Sudbury, but it took years of experimenting to perfect the processes of smelting and refining and also to develop the market for nickel. If the refined value of the nickel and copper produced annually at Sudbury is taken, it can be shown that it is equal at least to the value of the output of the ores at Cobalt. Of course the cost of refining the metals is much higher than is the treatment of the Cobalt silver ores. While at present the chief use of nickel is as a constituent of nickel-steel for armor plate, new uses for the metal are gradually being found in connection with alloys. The monel metal, for instance, composed of copper and nickel, has been shown to be a valuable material. The production of nickel at Sudbury will increase rapidly within the next few years. As already said, one of the companies is arranging to double its output.

Discussion.

Mr. Wilkie—I have much pleasure in moving a vote of thanks to Dr. Miller; the address that he has given has given me at least a much better knowledge of these mines than I had before; I was very much interested in his description of Cobalt; we have all heard more or less about it.

The President—It will certainly be a valuable contribution to our Report, and I wish to tender you, Dr. Miller, the thanks of our association.

(This Association is not responsible as a body for the opinions expressed in its Papers by Authors.)

A TRIP TO HUDSON'S BAY IN 1900.

BY L. V. RORKE, D.L.S.

By the building of railroads a better class of cruising vessels, and the desire and demand to explore unknown portions of the Northland, Hudson's Bay is fast coming into touch with civilization and the outer world, and its resources, physical conditions and people are becoming so well known, that to write about that part of our country seems but a repetition of things already told.

The writer, however, asks your indulgence and will endeavor to take you over a trip made in the summer of 1900, during the early days of this century, and recount some of the reminiscences which happened and observations made on what was then considered a very eventful trip. It was the 3rd of June, when the party gathered at Missinabi Station on the Canadian Pacific Railway, comprising 8 white men, viz.: surveyor, mining engineer, 2 press reporters, 2 miners, 1 capitalist and 1 cook, (the latter I am sorry to say was also a man of all trades and master of none, which is a very bad recommendation for a cook. Here we engaged from the Hudson's Bay Company 8 good Indians, 2 large birch bark canoes 30 feet long, and 1 small one for transportation to Moose Fort. It was found necessary to spend two days at this starting point in order to get the outfit and supplies in proper condition for loading into canoes and also to get the canoemen in proper condition for their work as most of you know that the Indian gets light-headed before starting away from his comrades owing to excitement caused by his anticipation of a good trip and being well fed or more probably by the introduction of liquor through some mysterious manner into the camp. During our stay here an event happened to mar the pleasure of the capitalist, he had brought with him from the large city a collapsible canvas canoe, which was to be such a great benefit on the trip, and by way of showing the novices how it behaved he set it up and started out on Dog Lake. Before he had gone 100 yards both canoe and capitalist disappeared under water, the former did not rise to the occasion, the latter did and made his way to shore; needless to say, he had his

first lesson on the trip, and the canoe had collapsed for the last time. We never saw it again; birch bark canoes were good enough after this episode. That same day by way of entertainment for the party the H. B. C. factor took us out for a sail on the lake in a small launch used for transporting goods across Dog Lake for use in the Michipicoten country which was then the scene of much active prospecting owing to gold and iron discoveries made, and not being thoroughly acquainted with the several reefs and submerged rocks, he ran the launch hard and fast on one which happened to be in line. After examination it was found that the top of the rock was about 4 feet across with sheer sides and deep water surrounding. One of the party managed to get a footing on the rock but with the cargo on the launch it was found impossible to move it off. It was then decided to cast lots to determine who of the party should take to the water and keep afloat as best they could until the boat was lightened sufficient to shove off, one after another according as our lot dictated the entire crew, with the exception of the captain, had to take a ducking, and then with a big heave, a long heave, and a heave altogether the craft settled back in the water and all hands climbed aboard.

These two events seemed to have an effect on the superstitious, and more than one of the party that evening desired to quit right then and there as some calamity was sure to overtake us. The next day, however, they threw care to the winds and about 4 p.m. we loaded canoes and said goodbye to railway, telegraph and mail communication, and started on the first stage of the trip. I might just here observe that it always has a beneficial result to start a long canoe-trip even, for only an hour or so on the first day with inexperienced men in the canoes. Everybody gets his place in canoe, and his necessary travelling outfit in proper shape, and the next day is started under a definite and well regulated system.

Now that we have actually started I may tell you that the object of the trip was to examine certain territory on the east coast of Hudson's Bay, said to very rich in mineral, to investigate the same and if the facts were as stated, to survey and capture this territory, and above all things to capture it before anyone else. You will, therefore, conceive that any little hardships and annoyances and even bad cooking were passed over good naturedly in anticipation of seeing and getting in on the ground floor of that promised land filled with precious metal. We were informed that two other parties were about to start to the same objective point, one by way of Temiscamingue and Abitibi River similarly outfitted to ourselves, and another larger party by ship from Quebec by way of Labrador and Hudson's Straits. Whether these parties actually

started we never heard, we certainly saw nothing of them, and were rather disappointed that the race for riches had not been more stubbornly contested.

Our second camp for the night was on Fairy Point, Missinaibi Lake, a camping spot patronized by that eminent geologist Sir William Logan in 1874, his name and date being inscribed on the rock as evidence. The following day having a fair wind we made good progress down the lake with the assistance of a small sail in each canoe and landed at Brunswick Post, situate near the outlet for lunch. Our cargo was here increased by two small cub bears which one of the miners purchased from an Indian for ¼ lb. of tobacco and smuggled them into canoe without the knowledge of the chief of the party. That evening we camped at Wary Rapids on the Missinaibi River and in the morning one of the cubs was missing, although securely chained the evening before, and strange to say next day while making a portage his mate broke his chain and also disappeared. The miner who had no knowledge of the habits of these animals concluded that they were very strong for their size. I knew they had received aid to make their escape. This was also an eventful day in another way, a huge moose was passed feeding on the river bank, the reporter fired five shots while within 50 yards of the animal, but we had no steak for supper, and the moose is probably still using the same feeding grounds, notwithstanding the wonderful story afterwards related through the medium of the press by said reporter, how he being the best shot in the company was intrusted with the rifle and secured fresh meat for a starving party.

Our sixth camp was at Beaver or Sharp Rock Portage, about 6 miles above where the Transcontinental Railway now crosses the river in the surveyed township of Eilber. Being in the Huronian Rock formation and several exposures in the vicinity, we decided to spend a day here prospecting the several quartz veins and taking notes on the water at this place.

Our tenth camp was after making the Long Portage (1½ m.) the last one on the river and canoeing through the swift water known as Hell's Gate, the river running in a gorge for some distance below the main falls. From here to the Moose River (so called after the junction of the Missinaibi and Matagami River) the river is wide and shallow. The shifting sands in the bed make the canoe channel very crooked, and in low water it is very difficult to get up stream.

On the 13th day out we lunched at the junction above mentioned, and proceeded down the Moose River to the large gypsum

deposits where we camped and examined the conditions. These are called "White rocks" by the Indians and are exposed in the low cliffs along the river banks.

The next day being the 21st we reached Moose Fort at 6 p.m. and the first stage of our trip was over. When within about half a mile of this important H. B. Co. post a salute of seven shots was fired by the approaching party, and on reaching the landing most of the inhabitants, men, women, children and dogs were there to see the arrival of a large party from inland which to them was next in importance to the arrival of the annual ship from London, England, with the yearly provision and news from the outside world. When we were still some distance away a number of men were seen moving about apparently dressed in tennis court costume. The reporter gleefully exclaimed, Hurrah! a tennis court, we'll have a tournament; Upon our arrival they were seen to be several half breeds in blue cotton shirts and mole skin trousers (which latter become quite white with washing), propelling by means of heavy long oars, a barge from the schooner "Mink" anchored in mid-stream to the landing. On the shore we were greeted by Mr. Broughton, the Chief Factor, then in charge of the Post. Rev. Mr. Renison, now English Church Archdeacon of Moosenee, Dr. Ross, the Company physician, and Capt. Taylor of the schooner "Mink," whose duty for years had been to pilot that craft with its precious cargo from Moose Fort to the several Posts around the shore of James Bay.

Before continuing our journey up the coast we found it necessary to remain a few days here to complete arrangements. Two sail boats were procured large enough to accommodate our party of eight and two half breed pilots. The boats had to be overhauled, corked and painted. One of these was on the lines of the Mackinaw fishing smack used on Georgian Bay and painted white, and the other known as the York boat much the same as a large Lumberman's Pointer such as used for freighting on rivers in lumbering districts, though not so pointed, and painted red. Isaiah Sailor and Mark Hannah were the two half breeds engaged to pilot the red and the white boat respectively. Moose Fort which was established in 1675 by the H. B. Co. is nicely situated on Hayes Island in the mouth of the river in Lat. 51 degrees 15 minutes N. and Long. 80 degrees and 15 minutes W. and was the collecting post for all the Company's exports from inland and shore posts tributary thereto, also the distributing point for imports which consisted entirely of necessary articles of food and wear, working tools and material. It was interesting to note that flour from Montreal had crossed the Atlantic to London and back to Moose Fort, a distance of over

6,000 miles to reach its destination 800 miles from Montreal. Pork from Chicago was also procured in a similar way. The only luxuries imported are confined to the personal orders of the Company's officials. A large clearing surrounding the Fort, and on other islands is cultivated and produces good roots, vegetables and sufficient feed for the small herd of cattle belonging to the village people. The magnetic variation of the compass needle is about 12 degrees *W*. At the time of our visit there most of the Indians were congregated around the place, having come in from spring hunting. They stay around the Company's quarters until September, when they depart to their several hunting grounds.

This Hudson's Bay Post has declined very much in importance since the Company have established new warehouses at Charleton Island 50 miles northeasterly where good harbor and dockage is available and the unloading and loading of the ships cargo can be accomplished in very much less time.

Our canoemen from Missinaibi were sent back from here with provisions sufficient to carry them through, they were of the Ojibaway tribe and did not understand the language or fraternize with the Cree Indians of James Bay.

The delay here was lengthened on account of the continuous strong, cold north winds against which no headway could be made. In fact, as was afterwards found, we made little progress unless we had a fair or ¾ wind aft, and much time was lost lying at anchor for favorable winds.

The party had grown quite restless under the delay here, and, although we were hospitably entertained by the Company's officials all were glad when the order was given to make ready for the second stage of the trip on the morrow.

On July 3rd, our boats stocked with provisions for three months, the fresh water jugs well filled, under a fair wind and outgoing tide we said goodbye to Moose Fort and headed northeasterly to Charleton Island, hoping to reach there the same day. About 4 p.m. however, the wind subsided and the anchor was cast in 50 feet of water with a clay bed, to prevent drifting with the tide. Both boats anchored within a few yards of each other as it was arranged that the Red Boat was to be the flag ship and the other was to follow closely, each had a large canoe in tow in case of accidents. About 9 p.m. a small black cloud appeared on the western horizon and gradually increased until a heavy gale and dense darkness overcast everything. The boats tugged and jerked at

their anchors and everybody looked very serious, even the pilots. It was evident that to remain was folly as there were no islands or land within 20 miles, so we pulled anchor and steered with the wind which was straight from the magnetic north. After two hours or more of the most perilous sail ever experienced by any of us the wind subsided and we cast anchor. Daylight breaking and the tide going out, we discovered we were in Hannah Bay, with shoals and reefs on all sides of us. Owing to head wind we remained there all day, and decided that instead of camping on shore at night we must utilize both the favorable winds and tides at all times to make progress. On July 5th, we reached Charleton Island, a large timberless island, except for a few stunted spruce in places along the shore and ravines. The interior is a rolling plateau, covered with moss, grass and wild flowers. The south and east coast line is rather bold, the escapement of sand and clay varying from 100 to 200 feet above sea level and presenting in some places a natural terraced effect. It was at a place known as Ships Quarters to the east of this island in early days of trading where vessels obliged to remain over till the following year wintered and I presume has now become Ships Headquarters instead of Moose Fort as formerly for embarking and disembarking cargoes. This island is also interesting from the fact that it was used as a beaver preserve by the Hudson's Bay Company, these animals are numerous and inhabit the small interior lakes. It was also near this island where Thomas James the explorer after whom the bay is named, wintered in 1631.

In proceeding from Hannah Bay to Charleton Island we passed the mouth of Rupert River to the southeast, where is situated Rupert House. It was here that the first Fort was established by "the Governor and Company of Adventurers trading from England to Hudson Bay" in 1670. It was also the first place in that territory to be visited by missionaries. Perre Albanel of the Jesuit Order left Quebec in 1672 and came overland via rivers Saguenay, Misstassini and Rupert, reaching there in 1674. The writer very much regretted that the delays had been so extensive that time would not permit visiting this, the most historic place on James' and Hudson's Bay. This Post is to-day (242 years later) I am told, the best fur trading point in those parts. Our route from here now lay close to the shore and we could find shelter behind the numerous small islands and reefs. In many places, however, when the tide was out the water was so shallow that we had to keep a mile from shore to avoid the submerged reefs and sand bars. The larger islands passed are Danby, Cary, Little Charleton, Mount Herrick and Struttons.

On the 7th we pass the mouth of East Main River, the northern boundary of the Province of Quebec, and are now travelling along the Ungava Coast line, one of the Northeast Territories of the Dominion. A Hudson's Bay Company Post was established at the mouth of this river in 1685 and a mica deposit worked for some time, but proved unprofitable.

The duck and sea fowl are numerous, the tree growth, (almost entirely black spruce) along the shore becomes more and more stunted and sparse as we proceed northward. We round Cape Hope on the 8th. The next point of interest was Paint Hills, about 40 miles further north, so called from the red and green stains on the surface of the rocks, due to oxidized metal no doubt contained in the rocks. The hills rise 150 feet or more above sea level.

On the 13th we passed Solomon's Temple, a low sandy island, in no way resembling the description we have of that wonderful structure of ancient days.

On the 15th we reached Fort George at the mouth of Big River. This Post was in charge of Mr. David Gillies, a Scotchman, who has spent his whole life in the service of the Company in these Posts. We were entertained most kindly by him, and it being Sunday the whole party attended church service in the little Mission Church. After a delay here of two days by north winds, proceeding on our journey we round Cape Jones on the 21st, and are now in Hudson's Bay proper, this Cape being considered at the northern extremity of James Bay on the east and Cape Henrietta Maria on the west. Sea fowl become more numerous, seals and shoals of white porpoise are seen coming to the surface in all directions. A few seals were shot from the boat as they would come up very close being of an inquisitive nature, but as they will not float none were captured. The oil, hides and blubber of these animals make up the greater part of the Eskimos' supply of food and clothing. The other large game which he hunts are the Polar Bear, Walrus and Cariboo. On bright days the mirages are clear and bewildering; on bright nights the Aurora Borealis are flashing and grand.

We reached Great Whale River on the 24th, where another important Post in charge of Mr. Luttit, is located. This Post was established about 1820, and the trading is entirely with the Eskimo, being beyond the Red Man's hunting grounds. The country now is practically barren of tree growth, the rock surface polished smooth by glacier action, and all clay or sand material is in the small creek valleys where wild flowers grow in great profusion. Indeed the extent and beauty of the flowers is a noticeable feature on this coast and is a great relief to the barren and desolate appear-

ance of the country in general. The schooner Mink had arrived from Moose Fort and was taking on this Post's cargo of fur, oil, bone, hide, etc. for export on the London ship, the arrival of which was expected at any time. While here we witnessed the interesting sight of the Eskimos bringing in two white porpoise, each measuring 15 feet long and 10 feet around the middle. Their mode of killing these is by harpoon attached to end of rope and at the other end is fastened a dried and scrapped seal skin filled with air, thus forming a ballon which acts as a restraint on the porpoise diving too deeply and gives the hunters a chance to follow and eventually tire out and shoot.

On the 28th having added an Eskimo (called Nero) to our party to assist the pilots who were now beyond their known territory, we proceeded up through Manitou-nuck Sound. In the evening while at anchor we were treated to the first sight of what is known as phosphorescent waves, which present much the same effect as the fire-fly in the air on a dark night, only on a large and grander scale and on the water surface. The theory is that they are due to the movements and presence of jelly fish in the waters.

The coast line is now more mountainous, a range of hills from 800 to 1,000 feet high runs parallel to the coast, and slopes gradually from shore eastward, reaching the maximum elevation about 4 miles inland. The eastern side of this range is quite abrupt, falling in steps of from 100 to 300 feet.

We reach the mouth of Little Whale River on the 29th which was arranged as the southern extremity of the promised land. Here we found abandoned Hudson Bay Company's buildings and having permission to use these, we selected one which, on being put in order and cleaned, served us as a cook, dining and store room. We pitched our tents and made this the headquarters for our investigations. Across the river was a camp of Eskimo consisting of seven families, making this their summer home. Their tents were of seal skin and much the same shape as an Indian wigwam. The women were employed making seal skin mits, socks and moccasins. These are very light and waterproof, and the Eskimo being more of a water than a land hunter they use these long legged socks fastened at the hips to keep dry while wading in water. Their clothing is made of cariboo hides. Their mode of travel is by Kyak and they will go out to sea 30 miles or more in these small craft. The Kyak is about 20 feet long and 2 feet beam, is made of a wooden skeleton frame covered with sealskin and entirely decked over except for an opening in middle large enough to seat the owner and around which an apron of the skin is left sufficient to belt tightly around

the waist, thus making it water tight; the propelling method is by double bladed paddle. It is said that the Eskimo can turn a somersault sideways in his Kyak in the water, but none of these at this camp could be induced to do so. I doubt that it is authentic.

Prospecting was now carried on in earnest and although deposits of silver, lead and zinc ores were found there was nothing sufficient to raise any enthusiasm amongst even the most sanguine of the party. While investigation work was being carried on amongst the hills and islands by the major portion of the party, it was deemed wise to make certain surveys embracing the best of these deposits, and this was accordingly done. Also a survey of a water power on Little Whale River about 2 miles up stream where a head of 100 feet is obtainable.

This territory is in Latitude 56 degrees north, and Longitude 77 degrees west, the magnetic variation is now 27 degrees west increasing more and more rapidly as we proceed northward.

Mosquitoes and black flies under certain conditions of the weather were the most numerous and annoying I have ever experienced either before or since.

White ptarmigan, wild duck and Canada geese which were plentiful, speckled trout from the streams and mussels from the beach kept us well supplied with a variety of food. Frost any month of the year is common. During the night of the 8th of August, ice $\frac{1}{8}$ inch thick formed on the water buckets at the camp.

Owing to so much fog the survey work was intermittent, indeed it was a case of seldom clear. During the cruise up the Coast on three occasions floating ice was seen away ahead, after a continuous north wind, and the water was too cold for bathing at any time.

The Nastapoka Group of islands, extending for about 100 miles northerly from Little Whale River and paralleling the coast 8 to 10 miles out, are very interesting from a spectacular point of view, they are crescent shaped, and in some cases where the basalt capping occurs present a castle-like appearance. They contain deposits of low grade iron ore and beds of jasper are fully described by Prof. Mickle in his report of an examination of these islands in 1901.

The high cliff immediately behind our camp at Little Whale River is discribed as follows by Dr. Bell, of the Geological Sur-

vey in 1877 and will give a general idea of the rock formation on the coast of those parts:

Coarse sandstone with conglomerated layers, pebbles of quartz	150 ft.
Concealed but probably a continuation of the last overlaid bluish grey dolomite	350
Lead bearing band of bluish grey dolomite	35
Massive blue dolomite	30
Concealed about	300
Yellow weathered compact blue dolomite	40
Single bands of solid grey sandstone	5
Thinly bedded grey sandstone with ripple marks and hard flaggy and shaly argillite	100
Bluish grey diorite porphyritic in parts	50
	1,060

Richmond Gulf, or Guf Hazard, off Nastapoka Sound, was probably the most interesting territory visited. Its shores are more rough, and broken by hills 500 to 800 feet in altitude and many island hills dot its interior. Its extent probably exceeds 500 square miles. The entrance to this gulf is by a high rock walled channel one to two hundred yards wide and two miles long. The tidal current through this channel is so swift that it forms large whirlpools and rushing against the abrupt walls makes navigation extremely hazardous, hence its name. Patches of snow and ice were to be seen on these hill tops in August. A trading Post was established here in 1732, but those in charge were massacred on two occasions and it was afterwards abandoned.

After spending a month, provisions were getting low and the country did not prove rich enough to delay longer, it was decided to return, even the wild geese were beginning their southward journey. I will now hurry along on the return trip. The first excitement was a small mutiny on board the flagship. One of the miners became so frightened during a run in a high wind that he threatened to shoot the pilot if he did not put into shore and anchor, even attempting to get hold of the rifle which was stowed away from the wet to put his threat into execution. He was, however, forcibly detained, but reasoning with him had no results, crying out to put him ashore at any price and he would walk (to where I do not know, neither did he). I knew, however, that starvation would bring him to his senses so the pilot was directed to make a landing as soon as possible without risk and we would let

him off. Before the shore was reached he had decided to drown with the rest of us.

During this same storm we had a good sight of a large Polar Bear in his natural haunts. He was pacing back and forth on a small rock island just a short distance to windward. Before the rifle could be extricated from its hidden depths (owing to the mutiny experience), Mr. Polar Bear had taken to the water on the opposite side of the island, and we saw no more of him.

At Great Whale River numerous souvenirs of the trip were accumulated by different members of the party, Eskimo costumes, Beaver coins, snowshoes, sealskin ballons and husky pups being the favorite articles of purchase. At Fort George we were glad to get milk, butter, lettuce and potatoes and have a change of food for a few days.

On September 12th, we reached Moose Fort and after spending two days getting Indians and replenishing our supplies with what was available, we started the up stream canoe trip. We learn from Bishop Newnham, who had just arrived by way of Missinaibi, that the water was very low in that river and decided to return by the Abitibi.

The first 100 miles up stream was tedious, the Indians alternately poling, paddling and towing, the other live weights walking where the banks were suitable.

Below the junction of the Moose and Abitibi rivers the waters of each are discernable separate from the other owing to the difference in color. The west or Missinaibi half being a clear brown color, the east or Abitibi half a muddy gray, and they flow along side by side for miles as it were each silently but resolutely fighting for supremacy.

The first portage, Clay Falls, where the limestone formation is so conspicuous, is reached on the 19th and portaging now became the principal order of the day for a week.

New Post is reached on the 21st where the factor in charge, Mr. Dobson, had a fine garden of potatoes and green corn, which he generously allowed us to extensively sample.

On the 29th Abitibi Lake is reached where we were held for a day more on account of high winds which make canoe travel on this shallow lake very dangerous, and the reason of the muddy grey water in the river obvious.

At Abitibi House the Hudson's Bay Company Post in charge of Mr. Skean, we again changed crews, securing Abitibi Indians to bring us to Temiskaming as it was too late in the season for the Moose Fort crew to come through and return before the ice would form.

At Lake Temiskaming we got the steamer to foot of lake and thence by rail to Mattawa, where the party disbanded and dispersed to their several homes, some sadder but wiser, and all glad that the eventful trip was over.

Mr. President and Gentlemen—Permit me in conclusion to make a few remarks relative to the past, present and future of Hudson's Bay and the surrounding country.

Past. Hudson's Bay was first discovered by Henry Hudson in the year 1610, though Dr. Nansen in his recent book, "The Northern Mists" holds forth strong arguments that the northeast lands of this continent were visited by the Vikings as early as 999, coming from Norway and Greenland. However, it is not at all probable that the straits to this large island sea were navigated prior to that disastrous trip for Hudson, when he made known to the world the existence thereof, and lost his life in doing so, but it remained for that intrepid adventurer and trader Radisson in 1667 to follow up this discovery, explore the country tributary thereto and establish trade relations, from that time down to the present (in early days with keen rivalry and warfare, now with persevering and peaceful competition) Hudson's Bay has been the scene of trade and traffic with the natives in the skins and animal products of such as inhabit that forest, land and water. For two centuries and a half destruction of these animals has been carried on without any attempt at conservation, and one of the greatest resources of the country is almost depleted.

Present. The spirit of adventure of olden days to seek unknown lands with a desire for fame, for knowledge, and for gain has been superseded (probably because there are no more lands to discover) by the more modern desire for development. Modern ideas, modern ways and increasing population demand it. Today in this country it is the great national work. Civilization is expanding rapidly within the limits of our own country. The lines of production and development are being shoved northward, and the day is not far distant when Hudson's Bay will at least be a highway for transportation of products from the northern and middle lands of the Dominion.

Future. What future development will prove respecting the production of the country adjacent can not be guessed at. Personally, I am not enthusiastic over its possibilities, nor are the majority of those who have knowledge of the conditions, but this must not condemn it. The country is becoming accessible, previously it was too remote to entice the prospector and pioneer, now five or six days from the Railroad will suffice to land the explorer in James Bay, and thence by water to any point. Three lines of railroad are already being built northward with terminal intentions on the shores. Within the next 10 years thousands of people will have been and seen for themselves, where the soil is productive it will be tried, where the mineral indications are favorable it will be prospected and developed, the extent of timbered lands will be exploited, and progress and habitation will follow just so far as the lines of productiveness extend, whether this be to the shores of James Bay, to the polished rocks of Hudson's Bay or to the ice clad hills on its northern coast.

Discussion.

The President—You have heard another very interesting paper to-night. Does any one wish to ask any questions or make any remarks?

Mr. Speight—I am sure we are much indebted to Mr. Rorke. I quite agree with the President as to the value of that paper. We have been very much instructed and enlightened by his very fascinating paper, and I have great pleasure in moving a vote of thanks to Mr. Rorke.

The President—You have heard the motion and I have much pleasure in conveying the thanks of the Association to Mr. Rorke.

(This Association is not responsible as a body for the opinions expressed in its Papers by Authors.)

TAR MACADAM ROADS.

BY J. HUTCHEON, D.L.S., O.L.S.

The object of this paper is to describe briefly the work we have done in Guelph in tar macadam construction, the methods we have employed and the results obtained.

Our first work of this kind was in the year 1908, on a short street in the centre of the city, having a superficial area of 992 square yards.

This was followed by another street having an area of 2,956 square yards, which was commenced in 1908 but was not completed until the following year.

These pavements were laid with a Telford base, with the joints between the stones well chinked, and then covered with broken stone and thoroughly rolled.

The stone for the surface was heated, tarred and placed in a heap for a time before being used. It was then spread on the street to a depth of about three inches and rolled.

The finishing coat was of half-inch stone heated and tarred in the same way, except that pitch and a quantity of Portland cement were added to the mixture. After being rolled, a sealing coat was applied to the surface. Traffic was not allowed on the street for a number of days after completion.

The tar used in this work was heated in ordinary tar kettles, the capacity of which were so small that wark progressed very slowly. The cost of the work which was done by day labor, amounted to about $1.66 per square yard.

The streets are subject to a large amount of light traffic and after two or three years use are apparently as good as ever, and compare favorably with some higher priced pavements laid about the same time.

The possibility of making good roads with tar macadam having been demonstrated, we set about in the spring of 1910 to change our methods of construction so as to expedite the work, to reduce the cost, and to bring about those changes without investing any considerable amount of money in a tar plant.

Gravel being cheaper than stone, a five inch concrete base of a one to six mix, was used instead of the Telford foundation. The excavation and concrete work were done by contract at a cost of 64 cents per square yard in 1910, and 52½ cents per square yard in 1911.

The tar macadam surface has in both 1910 and 1911, with one exception, been laid by day work, using corporation labor.

In the preparation of the first course instead of heating the stone and mixing on a board, as in the earlier pavements, the penetration method has been adopted and found to give good satisfaction. For the finishing coat of fine stone it was found necessary to heat the stone and mix with the tar while hot.

For boiling the tar we have used an old tubular boiler set in brick work in the ordinary way, the tar being poured in through the manhole at the top, from an elevated platform, and when ready for use is drawn off into the tank waggon through a two inch pipe in the bottom of the boiler. As the boiling proceeds, the consistency of the tar is frequently tested by cooling a little of it in a pail of water, and with reasonable care in testing in this way, a product sufficiently uniform for the purpose can be obtained. A slow fire is used under the boiler and constant stirring is required to prevent boiling over, and owing to the heavy fumes given off, it is rather trying work.

The method of laying the roadway we have been following, and by which we have obtained satisfactory results, is as follows:

When the concrete base has become strong enough to carry the steam roller and waggons delivering the stone, the surface is swept off and coated with hot tar.

The broken stone varying in size from ¾" to 2½" is then spread to an even depth of about three inches and rolled once or twice with the steam roller. After rolling the stone is sprinkled with hot tar applied by hand from sprinkling cans, care being taken to distribute the tar as evenly as possible, so that all the stone will be coated.

The surface coat is prepared by heating the fine stone of ¾" size and under, from which the dust has been removed, and mixing it on a board with hot tar which is applied by a sprinkler as the stone is being turned over.

The mixture is then spread on the roadway and carefully raked to an even depth.

When the stone has become cool, rolling is resumed and continued until the surface is thoroughly consolidated, after which it is given a sealing coat of hot tar applied with a brush, then sprinkled with sand, and in a few days thrown open to the traffic.

About two gallons of tar per square yard was used for the whole work, and was found to give better satisfaction than when more was used.

In the work of last year, using coal tar from our own gas works and charging quarry price for our broken stone, the cost of the three inch tar macadam surface amounted to forty-nine cents per square yard, made up as follows: labor and teaming 21.3 cents, stone and sand 16.2 cents, tar 5.7 cents, Total 49 cents. Adding to this 52½ cents per yard for excavation and concrete base, and 3 cents for inspection and incidentals, makes a total cost for the complete pavement of 1.04½ cents per square yard.

There is doubtless much to be learned as to the best methods of handling this work and failures no doubt will occur, but our experience with 24,000 yards which we have laid, would seem to indicate that on residential streets in small cities, where local materials are available and a low-priced pavement is demanded, tar macadam is one of the most promising paving materials now before the public.

Discussion.

Mr. Hutcheon—I think in doing this work the preparation of the tar is about the most important part. It requires reasonable care to get it right. It does not need any high class of work. Our work is all done by Italians up there—the preparation of the tar and the raking of the stone. If you don't rake your stone very carefully you will get a wavy surface, whereas careful raking and rolling will eliminate all that. The cost of it is pretty low, although we expect to reach a dollar a yard, and at that price I don't see anything better for certain purposes.

Mr. Hutcheon, then, very good naturedly answered the following questions during the discussion which followed:

Question: You use a five inch concrete?

Answer: Yes, but I think we will reduce to four inches on some streets. The reason we adhere to five inches is that we have a 15 ton roller.

Question: What proportion of cement?

Answer: One to six, but the best work has all been done by contract so far. It compares very well with other pavements which are promoted by contractors.

Question: That includes the concrete foundation and everything?

Answer: One dollar, four and a half cents, includes the concrete foundation. 49 cents is the cost of the surface. The tar costs us $1.25 a barrel.

Question: How do you drain?

Answer: The storm drainage is taken care of outside of that. It is first attended to before the base is laid. I am speaking only of the pavement.

Question: Are you using limestone for your broken rock?

Answer: It is mostly limestone.

Question: And it is pretty porous?

Answer: In some of it we use Hagersville stone and a little Dundas stone, but the most of it is local stone we gather off the streets.

Question: Do you find that as satisfactory as granite?

Answer: It is good enough for light traffic.

Question: It wouldn't stand much hard wear?

Answer: It is standing better than the asphalt block, which costs about $2.50 a yard. I don't want to knock asphalt but I think the tar with good limestone is good enough for ordinary light traffic for a long time. I don't know that it would do for Yonge Street or King Street. Your brick here will cost you over $2 a yard. We have as good a concrete as we would put under any pavement, so that it would only cost us in the neighborhood of 50 cents to put on new surface.

Question: Do you think there would be any difference in the use of trap rock and limestone?

Answer: There might be a difference.

Question: That is as far as the cementing of the tar?

Answer: It was formerly thought that tar did not bind with trap rock as well as with limestone, but I think that idea is fading away. The boiling of the tar to get the right toughness is one of the main things in the binding qualities. If you get it too hard of course it is brittle and in that event you have to add more raw tar.

Question: The cost of this road you constructed is much less than the cost of the York Road which they are building?

Answer: I don't know what other roads cost.

Mr. van Nostrand—$1 a running foot, $1,000 per thousand feet.

Mr. Hutcheon—That is less than half a dollar a yard. Our concrete base costs us more than half a dollar. It is a question to my mind whether in time macadam or concrete will become the favorite pavement for small towns.

Mr. Jupp—It is 15 to 17 feet wide, and $1.25 would be an outside price for the running foot for a 15 foot highway.

Mr. Hutcheon—What depth of stone?

Mr. Jupp—It runs to about 9 inches at the centre, not quite so deep at the sides. That includes grading. That is between the side ditches and any small improvements along the sides.

Mr. Hutcheon—That price I have given includes 8 inches of excavation. We have to pay in addition to that if we do more than that.

Mr. Jupp—The highway work about 15 feet wide there figures out considerably less than $2 per square yard.

Is the price of tar less than it can be obtained for here in Toronto?

Mr. Hutcheon—I don't know. That is the price which our gas works sells the tar at.

Mr. Jupp—Did you find say three or four inch treated tar surface on the Telford base sufficiently heavy foundation to sustain the traffic?

Mr. Hutcheon—Oh, yes, it is apparently as good as concrete. It is right in the centre of the town. It is not the main street but it runs into the main street. They put in a very heavy base. I hadn't charge of it that year.

Mr. Jupp—What depth would it run? Anywhere up to 12 inches?

Mr. Hutcheon—I think it was even more than 12 inches. It cost about $1.66 a yard. Of course at that price Macadam wouldn't go. People didn't want it. They would rather pay a little more and get something else. There was no one of course promoting the tar.

Mr. Jupp—You say your price for 5 inch concrete was 52 cents a square yard?

Mr. Hutcheon—That is what it cost us.

Mr. Jupp—That is letting a contract?

Mr. Hutcheon—Yes. Gravel is very cheap in Guelph.

Mr. Jupp—You make it a straight 1 to 6 mixture putting run gravel?

Mr. Hutcheon—Yes.

Mr. Jupp—do you vary your percentage at all according to the run of the pit?

Mr. Hutcheon—We have taken the straight run.

Mr. Jupp—Do you find that satisfactory for good concrete?

Mr. Hutcheon—Oh, yes. It is real good gravel. If it is getting a little fine we may have to check it. It is good enough for the purpose.

The President—I am sure we are greatly obliged to Mr. Hutcheon for this valuable paper. I think from the figures he has given, it will be of great assistance to the engineers in building and constructing roads.

On motion of Mr. Ardagh, seconded by Mr. Code, the paper was received and ordered to be printed in the proceedings.

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A MOUNTAIN RAILWAY IN NORWAY.

BY C. C. JAMES, C.M.G.

Scandinavia in these latter days is becoming better known to Canadians, and it is well worth knowing, for, apart from scenery which appeals to us all, the Scandinavians are a people of most admirable qualities. Norway, Sweden and Denmark have a close relationship to Britishers, for it was out of these northern kingdoms that the early discoverers of this continent came, and today the reigning houses are closely connected with the throne of Great Britain. The brother of Queen Alexandra occupies the throne of Danmark (or Denmark); Queen Maud of Norge (or Norway) is the sister of King George; and Princess Margaret of Connaught, daughter of our Governor-General and cousin of King George, is the Crown Princess of Sverige (or Sweden). At the University of Christiania you can see the remains of the two Viking ships, one or both of which may have anchored in Labrador, Newfoundland or Cape Breton a thousand years ago. These fair-complexioned, flaxen-haired Norsemen are one of the races that have gone to make up the mixed blood of the British Isles, and therefore of this Province of Ontario. We visit these lands, then, not as aliens, but as distant relatives, and find a keen pleasure in studying their characteristics.

Norway is a land of myth and legend. It is the ancestral home of Odin and Thor, whose memory we perpetuate in Wednesday and Thursday, the home of Ostara, the Goddess of Spring, whom we recall in our Easter, of Niki, the terrible water demon, who suggests "Old Nick," and of Juki and Bil, the demons of the ebbing and flowing tide, who, in the opinion of some, are the originals of Jack and Jill. Any country having a bountiful folk-lore is certain to be an interesting country for the traveller. Folk-lore, myth and legend are usually associated with mountain and valley, with stream and torrent, with nature in variety, and a visit to any one of the three kingdoms making up Scandinavia will fully realize all the expectations and anticipations of the traveller.

Norway is well named, for it is a northland. Its southern extremity is in the same latitude as Port Nelson on Hudson's Bay, and its northern limits stretch well into the arctic circle. It begins just about where Ontario hopes to end. It is about 1,100 miles long by 270 miles across its widest part. The railway which I am to refer to, running from Bergen eastwards to Christiania, 300 miles in length, is in the same latitude as the southern part of Greenland, the northern part of Hudson's Bay and the southern part of Alaska. It is about one thousand miles further north than Toronto.

Norway is a mass of mountains. These are not in well defined ranges as in British Columbia, but are jumbled together in masses, so that the term "A Sea of Mountains" is more applicable to Norway than to our Western Canadian Province. Take a mass of mountains and then depress them so that the sea can flow into the valleys and you have Norway with its irregular coast, fringed with 150,000 islands, and having deep cut winding valleys running far in, precipitous mountain sides rising from the level water floor. This makes a country of fjelds and fjords. Fishing and lumbering will naturally suggest themselves as the main occupations of a people occupying such a country, with manufacturing lines dependent upon the products of these two occupations, and farming taking a subsidiary place.

Out of the total export of $76,000,000 in 1910, the following were the main constituents:

Fishery products	$22,600,000
Oils and manufactures of oils, etc.	3,500,000
Lumber, wood pulp and manufactures of lumber	21,300,000
Paper	6,000,000
Leather, skins, etc.	4,700,000
Minerals and crude chemicals	4,000,000
Animal food products	3,700,000

There are four principal cities or towns in Norway; Christiania, the capital, in the south east; Stavanger, "the place where the sardines come from," in the south west; Bergen, the old German trading post circled by mountains, in the middle west; and Trondhjem, where the Kings are crowned, in the north west. Communication between these four cities was carried on in the early days by water; as settlements extended, roads were constructed, and these are to-day the pride of this northern country, for you can drive all over Norway with a stout little Norwegian pony to pull your stolkjarre. The best way to see the country, however, is on foot, and you will meet the English tourist on foot in

all parts of Norway, though the Germans in these later days are following the example of the Kaiser, and are making this northland a holiday country. These northern people, however, who seem to be born engineers, must have railways, as do other countries of Europe, and so they have shown the world what they can do.

In the summer of 1909, I went on an agricultural visit to Denmark and Sweden. I decided to take in Christiania on my tour. In securing my tickets at Cook's, in London, I asked the clerk if I could not return by Bergen and the North Sea. "Certainly," he said; "you know Cook's will take you anywhere." He gave me a bunch of tickets and I asked no questions for I knew the tickets would bring me through if only I followed the man from Cook's. I did not know until I reached Christiania that I was coming back by a new railroad that was not quite complete. It was in that year that the Norwegians were completing a transmountain railway from Christiania to Bergen. By means of an old narrow gauge road through Drammen, and a boat trip up Lake Kroederen, I reached Gulsvik, then the eastern terminus of the road. I was so charmed with the road from Gulsvik to Bergen that I determined that some day I would return and go over the completed road. The opportunity came in 1911, when I made the through trip from Bergen to Christiania, and my desire now is to repeat the trip, for a more delightful and interesting railway journey I have never known. It is a journey made only by day. It begins in summer land, takes you gradually up through the trees and shrubs and grass and moss into and through the region of perpetual snow and glacier, and brings you down in the evening again into summer land. It follows winding rivers from their emptying into the fjords right up to their source in the glaciers; it climbs slowly and carefully along the mountain sides and keeps its footing in almost impossible places; where it cannot go over a mountain or curve around it, it simply goes through it. The construction of this road was a daring undertaking, it was a stupendous task that these Norwegians set themselves in linking up the eastern and western settlements of their country, but they did it, though it took about thirty-five years in all to complete the work, and it cost a large sum of money also, larger to a people like the Norwegians than would appear to us in this extravagant western continent. The most expensive part of construction was the 6¼ miles east of Myrdal, which cost about $250,000 a mile. Keep this in mind, that while a dollar in Toronto does not mean as much as a dollar in Winnipeg or Calgary, it represents much more than a dollar in Bergen or in Christiania. All things considered, the building of this railway was the greatest national undertaking of this interesting northern people.

The building of mountain railways started in Austria in 1848, when the Semmering railroad was begun, running from Vienna to Trieste, climbing to an elevation of 2,946 feet. Following this was the Brenner Railway from Innsbruck over the Brenner Pass to Bozen, reaching an altitude of 4,485 feet. This was completed in 1867. Other railways followed in Switzerland, in which world-famous tunnels have been constructed, the Mt. Cenis tunnel being 13,342 yards long and the St. Gotthard, 16,295 yards long. What makes the Bergen railway equal or superior to these? It lies as far north as the 61st parallel of latitude, where the difficulties due to snow and ice must be almost at their maximum, and for 62 miles it runs above the fir-tree limit, and for 31 miles is entirely above the tree limit, in one place exceeding the tree limit by 1,640 feet. Sigvard Heber, Civil Engineer of the State Railways in Norway, makes a comparison thus:

"There are railways in Switzerland which go higher; there are railways in America which have difficulties to overcome in the form of snow and avalanches; but none of these railways lie so far north as the 61st parallel of latitude, where the climatic conditions are so severe. The St. Gotthard Railway, or the Arlberg Railway, to correspond with the Bergen Railway, would need, instead of going up to an altitude of some 4,000 feet, to mount to a height of 8,000 feet or even more."

The construction of this road indicates the determination, the energy and skill of the Norwegian people, and proves their great ability as engineers. Transport roads had to be constructed in advance of the railway and tramways built. In the Flaam valley, where we stopped over for two days, we walked up and down the old transport road which with 17 zig-zags climbs 984 feet and finally reaches the foot of Myrdal mountain. Here we saw the remains of the wire cables used for hauling up supplies, the empty houses that had been built for the engineers, and the abandoned power house at the falls from which came the power that drove the drills through the mountain in the construction of the Gravehals Tunnel, which pierces the mountain 1,968 feet below its summit. The tunnel is 5,796 yards long and the train takes between 7 and 8 minutes to pass through. If ever you go to Norway be sure to arrange for a few days in the Flaam valley. You get off at Myrdal station which lies at the eastern portal of the Greveshals tunnel. On a terrace or shelf of the mountain you will find a good hotel overlooking one of the most picturesque valleys of the world. A good road runs through the entire length and on foot you can follow the river to tide water, or you can climb and climb, past lake after lake and waterfall after waterfall, until you put your foot on the

perennial ice and snow in which the river finds its source. You will not have gone many miles before you will have your coat off and it will be a new sensation to step aside a few yards from the road and indulge in snowballing in your shirt sleeves. There are natural shower baths also that tempt the weary traveller, but you must be careful for there are tourists on foot coming and going all the time.

This road which has added fresh interest to touring in Norway is quite unique in its scenery, but what impresses the observant and thoughtful traveller is that it is a triumph of engineering skill. At first one wonders at the long time taken in its construction, but when you have gone over it and have seen the immense amount of rock work, of filling and of tunneling, you are surprised that it was done at all. For instance, the second longest tunnel, the Haversting, 2,520 yards in length, was hand drilled from portal to portal and took over five years to complete. Further, you must remember that while the original surveys had to be made in the winter, most of the work of construction could be done only in the short summer. In the tunnels, however, work could be carried on the year round and stories are still told of privation, suffering and death, when the great storms of winter covered their barracks to the chimney tops and food and fuel ran low; but all great works like this are marked with human suffering and heroic sacrifice about which the pleasure seeking world thinks little as it enjoys the results of their work.

I have written this short sketch of the Norwegian mountain railway with this end in view that if ever you are fortunate enough to take a trip to Norway, you will not be satisfied with simply seeing the fjords on the west coast and the midnight sun at North Cape, but will take the most delightful trip over the railway from Bergen to Christiania and see and enjoy a great work, the product of surveyor, engineer and contractor. And when you read the full account you will conclude that the most arduous task fell to the surveyor who led the way into the uninhabited mountain plateau of the Lang mountains and amid the ice and snow, the intense cold and blinding storms, mapped out a way for the others to follow. You will think well of your brother surveyors of the north country and appreciate still more how important your calling is in the exploration of a new country and in the linking together of the parts of an old country like Norway.

There is a legend in Norway that when the task of making the world had been finished, some one of the angels called attention to the fact that they had forgotten to put any soil on the great masses

of rock in the northern peninsula. Norway had been overlooked. There was a scurrying to and fro in heaven and a little dust was finally swept together and scattered over the Norwegian rocks. Thus they account for their poverty of soil. When we recall that these people with the poor soil sailed to Britain, to Iceland, to Greenland and to North America; that they have built post roads and railroads, have harnessed the waterfalls and developed electric power, have led the world in extracting the nitrogen riches of the air, we say there are compensations, and we may perhaps try to emulate the vigor and valor and virtues of these fellowmen of the Northern Zone.

(Note: Any one further interested in the construction of this road from Bergen to Christiania is referred to a 95 page pamphlet by Sigvard Heber, Civil Engineer of the State Railways, entitled "The Bergen Railway Crossing the Mountains," published on the initiation of the Traffic Manager of the State Railways, J. W. Capplens Forlag, Christiania. It contains 2 maps and 122 illustrations. It may be had in English. After reading this, see an article in "The World's Work" for November, 1905, "A Feat in Railroad Building" by Lawrence Lewis, an article describing the building of a road over the Rocky Mountains from Denver to Salt Lake that has 29 tunnels in 11 miles and many extraordinary curves).

See also article in "The Technical World Magazine" for March, 1912, "It Had to be Done" by Carlyle Ellis, describing the construction of The Copper River and Northwestern Railway in Alaska, 1907-1911; Michael J. Heney, Contractor, and E. C. Hawkins, Chief Engineer.

Discussion.

The President—Gentlemen, you have heard Mr. James' paper. It is a very interesting one. If there are any remarks to be made I would be glad to hear them.

Mr. C. F. Aylsworth: Mr. Chairman, I am sure we have all enjoyed that very interesting description of the railways in Norway and Sweden, although perhaps we may not admire some of his poetical flights where he says they gathered up a little dust from heaven and sprinkled it over the rocks of Norway. I didn't think they had any dust in Heaven from my reading of Scripture. Perhaps Brother Gibson can enlighten us on that point. But, considering where the railway is and the climate, perhaps we should

not be surprised at his getting a little muddled, I have very much pleasure in moving a vote of thanks to Mr. James for his very interesting paper.

Mr. van Nostrand—I have much pleasure in seconding that motion. I am sure we are very much indebted to Mr. James for the trouble he has taken in giving us this interesting and instructive paper.

The President put the motion that a vote of thanks be tendered to Mr. James for his very interesting paper and that the same be published in the Annual Report, which, on a vote having been taken, was declared carried.

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OPINIONS AS TO THE SETTLEMENT OF THE CLAY BELT.

BY J. F. WHITSON, O.L.S.

The question is often asked how is New Ontario to be settled so long as free grant lands are to be had in the prairie districts in the West; the descendants of the early pioneer settlers in old Ontario have not yet forgotten the many hardships encountered in clearing off the timbered lands of the old province before they were in condition for the reaper and modern agricultural implements. The present generation prefer to talk of these difficulties rather than encounter them, and to-day we find the young men of Ontario moving west rather than north, while we have in Northern Ontario very large tracts in many respects equal, if not superior, to any vacant lands now left in the North-west, more particularly in what is known as the clay belt, where millions of acres are to be found in one body, extending for 400 miles along the line of the Transcontinental Railway, and along the line of our own Government railway, the T. & N. O., to Cochrane Junction, and along the extension of the Algoma Central Railway to Hearst Junction on the Transcontinental, and along the Canadian Northern Ontario Railway now under construction from Sudbury to Port Arthur, yet emigration from the old lands seems to pass us on the way west.

Investigations by capable and experienced men have been made on behalf of the Government, railway corporations and private individuals, and these studies have brought out very clearly what a vast undeveloped wealth is represented by our unsettled lands. The magnitude of the problem of settling these lands becomes apparent when it is realized that there is more good land suitable for settlement north of the Great Lakes than there is under cultivation in old Ontario. It is useless for me to here refer to the reports of the different surveyors who have been engaged by the Government for the last eleven years in outlining and subdividing that territory. With few exceptions they report that a very large proportion, from 75 per cent. and over, is fine agricultural land. In some instances a fear has been expressed that summer frosts would

be found a drawback until the timber was cleared off and the land properly drained, but was that not the case in many parts of old Ontario?

Government analyses of the soil in the clay belt by chemists, soil experts and practical farmers all agree that these lands are among the most productive known; and there is also the practical demonstration to be seen in many places around the old Hudson Bay Company's posts, at the construction camps along the line of railways, where marvelous crops are now growing; so that the demonstration is convincing beyond the possibility of doubt that these lands are wondrously fertile. The question of summer frosts in the initial stages of settlement is a very serious one. From my own observations in the north for many years I am convinced that as soon as the timber is cleared off the danger from summer frosts will almost, if not altogether disappear. There are among us to-day surveyors who have been engaged continuously in that locality during the summer seasons for the last eleven years, and I have written this paper really with the view to getting their unbiased opinions as to what they actually found that would retard settlement. Our Association should be very cautious and not express any opinions that might not be borne out. It is a very serious matter for a surveyor to express any views that might unduly influence settlement. It is probably wiser to be pessimistic than too optimistic in this matter.

If the climatic conditions are favorable we should now be able to settle a large portion of that district. Other conditions are much more favorable than they were in old Ontario. Railways have been built in every direction, good markets provided in the mining sections for everything that can be grown. Good colonization roads have also been constructed in many places by the Government, and it is hoped and expected in the near future that pulp mills will spring up on the main rivers, where water power is to be had in abundance and pulp wood in large quantities. Flourishing settlements would soon grow up in the vicinity of pulp mills. Settlers could get a market for their timber and employment in the woods during the winter season. In fact I am of the opinion that the agricultural prosperity of that new district in its initial stage will depend very much on the development of the pulp and paper industry. The Department has at present subdivided into lots and ready for settlement 110 townships in the clay belt, comprising an area of over 3,000,000 acres. Besides the subdivided area, over 1,000,000 acres more has been outlined into townships and ready for subdividing.

With a view to collecting reliable information from the surveyors who have had long practical experience in that district, I will call on the following gentlemen to express their views of the climatic and other conditions as they found them while engaged on their surveys from year to year. I will first call on Mr. T. B. Speight, who in his professional capacity has seen probably more of the clay belt than any other surveyor in the Province, and who has outlined a very large portion of it, as he and the late Mr. Niven were the first to lay down base and meridian lines through that district. Mr. Speight, I am sure, will be able to give us information which the public can safely rely on. After Mr. Speight I will call on Mr. J. W. Fitzgerald, C. H. Fullerton, James Hutcheon, J. S. Dobie, W. W. Stull, H. J. Beatty and J. M. Watson, who have all had several years of experience in that district in the laying out of new townships, and I would also call upon our venerable friend, Mr. C. F. Aylsworth, who over twenty-five years ago surveyed in Northern Ontario, and who for many years past has been surveying in the North-west territory in sections in many respects similar to the clay belt, and he will, I am confident, be able to make a fair comparison of the lands open for settlement in New Ontario with those now being so eagerly sought after in the West.

Mr. Speight—Mr. President, I have been through that country very considerably during the last ten or fifteen years, and to my knowledge and observation I have no hesitation whatever in saying that the agricultural possibilities of the country extending westward from Abitibi probably 100 miles west of Hearst will average at least 75 per cent. of fairly good agricultural land, comparing with Southern Ontario. But, of course, the roads and railroads have got to pioneer settlement, and, unfortunately for Northern Ontario, within the last few years Manitoba seems to have caught the eye of the public, of the emigrant, but by-and-by I hope it will turn to Northern Ontario when the railroad gets running through there. That there are great possibilities there is no doubt in my mind whatever. There are wet places and sandy places here and there, but surely there is that in Southern Ontario. We have a very large percentage of land that was not considered adapted for growing grain, but now, with the development of agriculture, lands that were thought worthless are becoming very valuable for fruit growing.

Mr. Gibson—What kind of timber have they up there?

Mr. Speight—It is mixed timber, spruce, poplar and balm of gilead. There is practically no maple. A great deal of the land will be very easily cleared. West of Hearst for hundreds of square miles a large amount of the land has been burned over and will be

very easily cleared; and the clearing in Northern Ontario is not the serious problem it was in Southern Ontario in the pine lands and heavy timbered lands. Of course it will have to be opened up with roads every five or six miles. You can't expect the settlers to do that, and it would be a shame to burn off the timber in the old-fashioned way when it can be sold for pulpwood. Almost every kind of wood on that land will be taken for pulpwood.

As far as climatic conditions are concerned, I am satisfied they are favorable. Of course they have summer frosts up there, and we have them down here. This last summer we had the first frost on the Mattagami on the 6th of September.

At Brunswick Post, when we went out on the 26th of May, 1907, the Hudson Bay Company's people were ploughing their gardens with a single ox. When we were returning the first week in September they were gathering potatoes, and it was just about as fine a crop of potatoes as I have ever seen in Southern Ontario. There were one or two farming friends with me, and they thought the average would easily be six or seven hundred bushels to the acre. Those who have been out in Northern Ontario the last two or three summers know that we have had the temperature there well over 90 degrees. I might have mentioned I have spent about ten winters in the north country, and, as I have often expressed it down here, to my mind the winters up there are preferable to those down here. Of course they have occasional cold days up there, but not more than two or three in succession, and the atmosphere is dry. Speaking with reference to the swamps and wet lands, look at the counties of Lambton and Essex and all through there. The earlier surveyors through that region reported the land worthless, and to-day it is almost regarded as the garden of this continent.

The President—Does the frost up there destroy the vegetation much?

Mr. Speight—It would, yes. That is, quite a severe frost; there had not been any up to that time.

The President—That was well towards the northern limit of the clay belt, and on swampy ground?

Mr. Speight—Yes, and that was 100 miles north of the Transcontinental, and in 1908 at English River, about 100 miles from what is now the town of Hearst, I saw the record of official meteorological observations, and the coldest they had it there was 33 degrees below zero; navigation was open till the last of October, and it had opened the first week in May. I think it is

much colder around North Bay than around there. As far as the most of the gardens along the Transcontinental Railway are concerned, they are very good, and everything would be a credit to Southern Ontario. Where I was last summer, at the Transcontinental crossing of the Matagami, now the town of Alexandra, there is one of the best gardens I have ever seen anywhere. In the first week of July I saw cucumbers, beans, tomatoes and potatoes, the latter out in bloom, and as to flowers, I never saw such a show of flowers in a private garden. So as far as my observation goes I have no hesitation whatever in saying there is a great future for that north country, and the climatic conditions, I am satisfied, will be found eminently satisfactory. Another drawback is the locking up of so much territory by veteran claims, which to my mind is a great disadvantage, and I think the Government might obviate this difficulty by purchase or otherwise.

The President—In the lakes you came in contact with did you find many fish?

Mr. Speight—Oh, yes, there are plenty of fish. We caught a sturgeon this summer at Matagami four feet long. There are plenty of them. The speckled trout also are fine. About a year ago last summer—I am not exaggerating at all when I say we caught them by the hundred in the Albany River. There is also plenty of game.

Mr. Fitzgerald—Mr. President and Gentlemen: I am very much surprised at Mr. Whitson coming here seeking information which he now has and which is given pretty fully in the surveyors' reports on Government surveys. The worst of it is the public men of Ontario won't take these reports and read them. A prominent Government official a few weeks ago was lecturing before the Canadian Club and he quoted some American magazine writer as to the climatic conditions in Northern Ontario. This American gentleman, who had been up there fishing for a couple of weeks, made the remark that he could never get up before the sun. Well, I will guarantee if that gentleman goes out with some contract surveyor, Mr. Speight for example, he will get up before the sun and before the moon too, and if he stays to the end of the job he won't know which is which. I thoroughly agree with the remarks of Mr. Speight. I think there is about 75 per cent. of that country fit for agriculture, but I don't think it is a question for the surveyors to decide how it is going to be settled; that is a question more for the Government.

The President—Might it not be advisable for the Government to take some advice from the land surveyors on matters of this kind?

If the surveyors' advice is good the Government might adopt some of their suggestions.

Mr. Fitzgerald—They won't even publish the reports. Some of them are reports written by myself, and they are apparently pigeon-holed.

The President—The surveyors' reports are printed every year in the Minister's report, and are available.

Mr. Gibson—Was your report favorable on the soil?

Mr. Fitzgerald—My reports were favorable on the soil, and as far as the fish go we did catch some speckled trout up there weighing five pounds. I have spent the last twenty-seven summer in those parts of the country indicated on those two maps, and I never saw anything objectionable in the climate. The frost there is not a bit more severe than down here. I have been up there from the middle of May to the 1st of October. We have slight frosts just the same as we have down in this part of the country, but I never saw anything that would deter settlement in any way. All that country is south of Manitoba; in fact, it is south of the international boundary. I think it is a grand country, and besides that there is first-class timber on a lot of it, especially along the Mattagami River, where there is some spruce that goes up to 26 and 30 inches, which is clean and would make first-class lumber, but it is a difficult question to decide how it is going to be settled.

The President—Now that railroads are constructed through that country, is there anything in your opinion that would prevent settlement from rushing in along the lines of railway or where good colonization roads have been constructed?

Mr. Fitzgerald—No, I don't think so, but as you have said yourself, the country is best adapted and attractive for the French habitant. The people that are coming to this country from the old country are not fitted to go into that country. They are mostly coming from the towns and great manufacturing centres, and they like to stay in like environments in this country. I think that country will eventually become nearly all French, that is my opinion.

Mr. Fullerton—Mr. President, I am a little surprised that the surveyors of New Ontario are being asked to give their views of the settlement of New Ontario. I came here this afternoon to get some information as to how I might help advertise this country from the valuable paper our worthy President had written. However, it is

rather difficult, not having prepared any facts, to give my ideas on the settlement of this country. I am more interested in that part called Temiskaming. I have never been farther north than Cochrane on the Transcontinental, but I know and believe that all of the clay belt in there is good land, except where you find a rocky ridge or low swamp. I think it is as good and perhaps better than most of old Ontario. I live in the town of New Liskeard. I think that it is perhaps better settled in that locality than any other part of New Ontario, or any other part of Temiskaming. Last fall at the fall fair the T. & N. O. exhibition car received nearly everything that they took in their car from that fall fair. If you had been there you could not but say that you never saw larger cabbages or larger turnips, and in fact all kinds of vegetables. We can grow wheat there almost, if not altogether, equal to Manitoba No. 1 hard. There is a grist mill up there now turning out very good flour. As to Ontario land surveyors taking a part in helping to colonize the country, I can't very well see how they are going to accomplish much. About the most they could do would be to write papers and have them published perhaps in the press or in magazines. A paper coming from an Ontario land surveyor or an engineer of some standing might perhaps receive more attention than from one who had land to sell. I have such confidence in the soil of that country that I last year purchased a farm, and when I get too old to survey perhaps I will farm a little.

There is one other thing. As regards the settlement with British emigrants, I believe that is out of the question. I have not seen anybody from the British Isles, except perhaps from Scotland, and I am not a descendant of a Scotchman, who I believe would make a good farmer. I believe that perhaps the Scotchmen would make good farmers in New Ontario, but take the Irishman or Englishman, I don't think they are suitable to the climate. Mr. Speight and Mr. Fitzgerald have been there in the summer time. It is a little colder in the winter, and it is then they get the hardships, in the cold weather and deep snow, but that paper that was read by Mr. C. C. James gave me an idea. We trace the relationship of the Anglo-Saxon and the Britisher with the people of Norway, Sweden and Denmark. I believe those are the places to advertise the lands of New Ontario. They are the people who are accustomed to that climate, and they are the people that have only the dust on the rocks to farm on.

We have a good thick layer of dust up in New Ontario. Our climate is not so cold as was spoken of in that paper, not nearly so rigorous. We have good markets for everything. I am paying $14 a ton for hay now, and I bought oats yesterday for 60 cents. I think I can go up in Perth County and buy hay for $10. The

farmers in New Ontario have good markets for everything, and in the matter of lumber and pulpwood, to anybody that is accustomed to a rigorous climate and knows how to wield an axe, New Ontario is the place for him.

The President—Mr. Fullerton, what success have your farmers in the vicinity of Temiskaming had in raising hay, oats, barley and potatoes?

Mr. Fullerton—They have good success. I think we can grow nearly everything that can be grown in older Ontario. The season is shorter all right, but the days are longer in the summer time than they are here. We have more sunlight in the twenty-four hours in the summer season than they have in older Ontario, and I believe the soil in most cases is a little drier than it is in older Ontario. You get more crop to the acre, and you have a better price for it when you take it off. You can grow nearly everything that you can grow here. Of course you can't grow fruit except apples, unless they are of the hardiest kind. We can grow clovers. We take off second crops and thresh them.

Mr. Hutcheon—In the few summers I have been in the north I have seen nothing to discourage anyone from settling there. One year we had frost in August, but at that time we were camped in a swampy place. I don't think on the high land it amounted to much. As to the settlement of that country, it seems to me, while advertising is necessary, that something should be done in the way of clearing off the land along the railway. Assistance might be given to settlers to go in there and clear along the railway, which seems to be about as good a method of advertising as anything. When traffic is open through there there will be a great many travelling. If the land along the line of railway was cleared and productive it no doubt would have a greater influence than anything else you can do. A certain amount of drainage may be necessary, but I think that first in trying to induce settlers it would be well to deal largely with some of the burnt-over areas. You could easily clear them, and I don't think you would have a summer frost on those burnt-over areas, and the settlers there should be fairly successful from the beginning.

The President—How do you think the soil compares with the best parts of old Ontario?

Mr. Hutcheon—When it has been burned over the soil is good. It looks well, and it will grow wheat and timothy, or probably barley. From the appearance of the soil and my knowledge of the climate, I would expect it to grow fall wheat. Just west of the

Ground Hog River there is a little area of burned ground along the railway. I don't know how far it extends, but my recollection is it is fairly large. That would be fairly convenient to the station and large enough to make it worth while starting a settlement there. On the river south of the railway there is a beautiful piece of country, as far as I could see, but perhaps a little too far from the railway to open at first. On the Missinaibi there was a small farm near the railway, although I don't think it was within sight of the track, but very promising land. On the Missinaibi there is a lot of good land that comes to the railway. If a few lots like that could be opened up and a few houses put on it and good crops grown I think it would be about the greatest attraction which you could give to intending settlers. I don't think there is much use trying to get settlers to go in there with the country in the state of nature, if they don't see anyone else ahead of them.

The President—Do you think the idea of building roads in advance of settlement is a good one?

Mr. Hutcheon—I would clear the land as well as build roads. I would expect a number of the navvies on those construction gangs would settle there. There are a lot of Swedes and Norwegians working on the Transcontinental who are a good type of men. They are working there on sub-contracts. I should thing a number of them could be induced to locate there and start farming. When the old settlers first came to this part of the country I don't think they knew much about chopping, still they made homes for themselves, and I think it would be found the same there. On the Missinaibi River, a few miles north of the railway, there is a great portion of the land that is burned very nearly clear.

The President—From what I have seen after the land is burned over there is little indication of swamp, as the drainage is fairly good.

Mr. Hutcheon—The drainage is good. The land that at first appears swampy, after being burnt over, the water soon drains off.

Mr. Stull—Mr. President and Gentlemen: I agree with what Mr. Speight and the others have said in connection with the richness and productiveness of the soil in Northern Ontario, but my experience in connection with the settlers is somewhat along this line: Those that have settled in Northern Ontario, for instance around New Liskeard and from North Bay west along the main line of the C. P. R. to Sudbury and Chelmsford are following up some industry, such as lumbering. The men work in the winter

time in the lumber camps and clear their land in the summer time. They have been fairly successful in that way. A settler for the first two or three years on a wooded farm has practically no chance of getting any return from the soil. If he cannot make a little money during the winter season he has a pretty poor prospect for the next summer. The only suggestion I would make (although I don't suppose I should make suggestions to the Department or to the Government in connection with colonization, as they probably know this already) is that if they are going to take settlers into the northern parts of Ontario, say along the Grand Trunk Pacific, they should create some industry in the timber country. For instance, on the large rivers, if they would put up pulp mills, whereby the settlers, when clearing off their lands, could get a market for their spruce timber, thereby having some means of earning money to carry them along while they were clearing their land, this I think possibly would be a very good suggestion, and if the Government could see its way clear to do this it would be the means of creating a settlement around each one of these pulp mills. Another thing, I don't think they should allow settlers in any particular locality without first exploring it and seeing what can be done in the way of drainage and roads, and also not to allow a settlement to go in unless that settlement is likely to be large enough to support and provide proper school facilities. The difficulty we have with our settlers around Sudbury and the north is that a few straggling settlers will strike out into the bush, and it will take them probably five or ten years before there are enough of them to form a school section; the result is that their children are growing up uneducated. Probably 80 per cent. of those we have around Sudbury are Frenchmen from Quebec. They probably make the best men to clear the land. The Swedes I think are also pretty good. We have several Swedish and Polock families in our district, and they seem to be fairly prosperous, and as far as the productiveness of the soil in Sudbury district is concerned, they are growing practically everything, but they are not growing wheat. They grow mostly oats and hay, for which they find a ready market. They grow vegetables, lots of potatoes of fairly good quality, although probably not as good as some that are grown on the sandier soils of Southern Ontario.

Mr. Fitzgerald—With regard to the frost in that country, fifteen years ago I was in the township of Murchison, 50 miles west of Pembroke, and on the 9th of July, not 100 miles north of Toronto, we had a heavier frost than I have ever experienced in Northern Ontario, and I have been in Northern Ontario from the 20th May up to the 1st October.

Mr. Aylsworth—I have had some experience in Northern Ontario. After I left my friend P. S. Gibson's Alma Mater I went out with Mr. Niven to outline the first townships north of Lorrain on Lake Temiskaming in 1886. We outlined seven townships there, and I remember quite distinctly when our larder ran low and our appetites high. We arrived at Wabis' Point very hungry and tired. We had had very little to eat, some bones and pieces of bread, and one thing and another like that. I looked away down Temiskaming to Wabis' Point and saw what I thought was a clearing, and down we went to the point and saw some potatoes and wheat growing. The potatoes we got there we cooked up with our bones and rinds, and I don't think I ever tasted anything in the heavens above or in the waters beneath that tasted as good as what we had that day.

As far as the fertility of the soil is concerned, I don't think that need be taken into consideration at all. The first year I was out in the North-West Territories on the Saskatchewan I saw frost on the water in our wash dishes every month in the year. The ranchers in there—one probably on an average to every township—would come around to our camp after a night's frost and say, "Well, it's pork and beans for us next winter." What little attempts at agriculture were made were frozen out every year, but after a while, when the land was cleared up, the climate became much milder.

You are seeking information from the surveyor's standpoint as to the most advisable methods of colonizing Northern Ontario. I think a great many of the remarks that have just been made here are a little wide of the mark. I don't think there is any use of the Government starting in in advance to make roads and create industries, because if they do they will just pamper the settlers, and I think after they get through they will be worse off than when they began. A great many of you know Mr. Bellinger, who has had probably as much experience in the North-West as any other man, and he said when they located the Doukabours over in the north-west corner of Manitoba and Saskatchewan the people said they were crazy to go in there and would starve to death. Those people went in there, and there they are yet, and they have made that country one of the most promising lands in Canada. At first nobody would go in there. Everybody was afraid. People had gone in there before and had been frosted out, and after the crowds had all left it the Doukabours went in and after breaking up the soil and turning the sod up to the sun it created a different temperature, and the frosts that were so killing are not there now. They produce everything, the finest vegetables, the finest grain and

the finest stock in the North-West, and everybody is after their land. You remember when the agitation was up to dislodge the Doukabours. That was an effort on the part of the people living outside to get the land of the Doukabours. So promising have these Doukabours made that land that everybody else was after it. So I think if the Government, in place of spending money on ditches and roads, would, before starting to do this, search over these European countries and get a people similar to the Doukabours, it would be the wisest thing to do. I have been around amongst the Doukabours probably as much as any other man in Canada, and with all the charges that have been made against them, I don't think there is a better class of people ever came into the Dominion of Canada than the Doukabours are. They have their religious peculiarities and all that sort of thing, but as farmers and settlers I think they are models. I don't advocate bringing Doukabours into Ontario, but there are other nationalities who have not those religious peculiarities, and if they were located out there you would find a class of people like that would do more to demonstrate the feasibility of Northern Ontario as a farming country than any other class could do. The Government would sooner have Britishers and Englishmen and that class of people of our own flesh and blood. The experience out in the West is that the Englishman is not altogether a satisfactory recruit to the country as a farmer. He is not a model farmer. The class that have been coming out there are not the best class of Englishmen; they won't come out to this country. The men who come out here are impracticable. Taking into consideration the impracticability of the Englishman, he wouldn't do at all as a settler in a country where they have to do the work that they have to do on a farm in Northern Ontario.

With regard to your suggestion that perhaps the surveyors would be good judges as to land and the prospects of Northern Ontario for settlement, surveyors, of course, should be experts in the quality of soil. In fact one of their duties as Dominion land surveyors is to report on the quality of soil of every section and quarter section they survey—report it first-class, second-class or third-class, as the case may be.

I think that these early frosts will disappear as the land gets clear. You have heard it said many a time through reports that nobody could raise grain north of the line of the C. P. R., and now the raising of grain has extended away out in the Peace River country, so much so that one or two of your members here have bought farms out in the Peace River district. I think it is just a matter of the intelligent settlement of that country, because I don't think there is any doubt as to its capacity of raising the

very finest of vegetables and grain, as in other parts of the Dominion of Canada.

Mr. Watson—What success have the Doukabours had in the clearing of the wooded lands in the West?

Mr. Aylsworth—They settled on the prairie land; all they required was a steam plow. It was frost-ridden before that. I consider, as I said before, that they are the best class of settlers that have ever come into that country. They went where there were no roads. They constructed bridges across rivers 150 feet wide, built their own roads and graded and corduroyed them, and never asked for any Government assistance, and put up their own mills. They took advantage of everything that was going on in the country.

Convention adjourned to 2 o'clock p.m.

Afternoon Session.

At 2.30 p.m. the President called the meeting to order and requested Mr. Dobie to give his views as to what he thought of the summer frosts in Northern Ontario, and also as to the colonization of that country.

Mr. Dobie—I have spent a good deal of time in the clay belt. I went in there for the first time in 1903, and have been in through there nearly every year since, and I have never had any experience with frost in there in the summer time. I have seen stuff of all kinds growing in different places in the clay belt, and away north of what is considered the clay belt proper. I have been there until the 15th of October. I have seen frost in October, but in the growing season I have never seen any frost that would interfere with the growth of the same kind of crops as are grown on the north shore of Lake Huron, such as hay, oats, and so on. Last summer I made a trip down the Albany River. I went in at Sioux Lookout or Graham Station on the Transcontinental, and returned by the Mattagami to the railway crossing, and on that trip I visited different Hudson Bay posts in that portion of the Keewatin territory about to be added to Ontario. I saw gardens at the different posts, and the products were just as good as you would find anywhere. I walked along 40 miles of the grade on the Transcontinental which goes down to Hearst Junction. On the journey I stopped at various engineers' residences on the line of railway, and every one of them had a garden, and you know how much time the average engineer

has to devote to gardening. They raise potatoes and vegetables of all kinds and beautiful flowers. I saw potatoes at all those places, just as fine as you could get anywhere, and other vegetables as well. Archdeacon Rennison told me that at the mouth of the Albany River they ripened cucumbers and various other vegetables of that kind. I can't see anything that would make that country any less desirable from an agricultural standpoint than the section of country where I live on the north shore of Lake Huron. It is a better country, because when you strike a township up there it is all good land, not broken up with rock. When that country is cleared and drained I think that the liability to summer frosts will entirely disappear. On the north shore of Lake Huron twenty years ago we were liable to get frosts in any month of the year, and now we have none. Personally I am very enthusiastic about the prospects of the clay belt when the land is opened up.

The President—I think this discussion cannot but lead to good results. Speaking generally, the opinions which have been given by the surveyors who have had long personal experience in that section of New Ontario go a long way in further convincing me that we have in the clay belt a large area which the Government of this Province need not hesitate in opening up for settlement if they can get the right class of settlers.

The President—Mr. Beatty, we would like to hear some remarks from you as to what you think of the future prospects of New Ontario.

Mr. Beatty—Mr. President, I don't know that I can say anything that will be of much assistance towards the development of that country. I only spent three summers in what might be called the clay belt proper. One of those was on the Missinaibi, at the crossing of the Transcontinental, and from my observation of the soil there and the natural resources of the country, the great problem with reference to settling that clay belt appeared to me to be drainage and roads, and the settlement, to my mind, in order to be successful and not discourage those who come in at the start, would need to be undertaken on a large scale. It does not look to me to be very bright for one settler to go into a certain district, or two or three settlers together, because the surrounding area, being all bush and in the swamp country, the temperature will keep too low and there will be too great danger from summer frosts, because, with all due respect to what our public men say about the resources of that northern country, there are certain drawbacks at present which I have no doubt will disappear as settlement is carried on. With reference to summer frosts, to anyone who goes up there now the

outlook is very discouraging. In August of 1907 we picked as fine strawberries as you ever saw growing anywhere, but it was on the 15th of August. Now on the 23rd of August the water froze in the wash basin; half an inch of water left in the wash basin over night froze solid. That looks bad at present, and I think it is due to the large area of swamp. The climate is cold and is kept cold. The frost does not get a chance to get out. It would seem a pity to destroy the timber of that north country by a big fire, but one big fire in there would do a lot of good. There is a lot of timber there, but it is very doubtful if it would pay the settlers to take it out, it is so small.

Mr. Gibson—Is there much tamarack in that section?

Mr. Beatty—No, not a great deal, it is mostly spruce; but my observation in that area was that where you had a stream you found fairly good timber on each side of the bank, but if you got three or four or five chains away from the bank of the stream you ran into dead level wet swamp. You have got to drain it and build roads or you can't encourage settlement there, and that has to be done on a large scale. It is a very difficult thing for the Government to decide on what method to adopt, because giving large areas to corporations to settle has not proved successful from past experience, and unless there is a large area undertaken to cultivate at once I think the settler is going to be discouraged at the start. Looking at past experience in what we call Old Ontario, I know in my own country of Renfrew the very best land or some of the very best land is on what we call the fifth line of Bromley. That was originally settled by Germans. They came in there and they were starved out and they went to the highlands and there they grubbed and worked for a living all their lives. Scotchmen came in and bought these valleys up, when they deserted them, and they drained them and to-day you have some of the best farm lands in Ontario right there. I know one farmer that has 200 acres and he wanted $17,000 for it. I know of old Scotch families who settled originally around Ottawa, which was then Bytown, that were starved out and went back into the country where the frost didn't bother them so much, and down around Ottawa to-day they have no frost, and it is just a question of waiting until you get the bush off that north country and let the sun have a chance to get in and let the ground dry, and then the frost will disappear.

I doubt very much if the timber resources of that country are as large as we are led to believe. My recollection is that I have read speeches of some of our public men making calculations on re-foresting some of that spruce area in 50 years. The bush

that is on there took a great deal longer that 50 years to grow, and much of it is very small. Our Association ought to be able to give some suggestions as to the mode of development which doubtless would be of use to the Government who apparently to-day are undertaking this matter on a serious scale. They are of course giving a large sum of money toward the development of it, but the great problem I see is the drainage. The drainage has to come first, then roads and then the settlers. The settlers won't go into the back country and clear it the way our fathers did 50 years ago. There is no doubt whatever in my mind we have some very extensive settlements in Old Ontario where the best thing that could happen with reference to them would be for the Government to go in and take these old hardy settlers out, and turn that old hilly stoney land into forest reserves, and take these men up north and start them where they would get something for their work.

The President—I would like to hear from Mr. Watson, who has had several years experience in that country.

Mr. Watson—I don't think I can say much. I agree with Mr. Beatty that it is a matter of drainage and roads chiefly. I think the summer frosts problem would be cut out by drainage completely.

Discussion.

Moved by Mr. Van Nostrand, and seconded by Mr. Ward that Mr. Whitson's paper be received and printed in the proceedings.

(This Association is not responsible as a body for the opinions expressed in its Papers by Authors.)

A FEW OBSERVATIONS ON CITY SURVEYING.

BY T. B. SPEIGHT, O.L.S.

It is an old tradition that the earliest records we have of land surveying come from the banks of the Nile in ancient Egypt, where the boundaries were annually destroyed by inundations and it became necessary to have the holdings of the different owners or tenants re-located.

Coming down to more modern times we find that in the early days of Canada, the necessity for dividing the wild lands into farms was one of the first things that presented itself to the authorities. Deputy Surveyors were appointed by the then existing government and so far as is known each one so appointed was required to demonstrate his fitness for the work. This may be said to have been the origin of our present Board of Examiners in Ontario, and it has been in continuous existence in various forms, since that time. Up to the year 1892 the sole control of the Board of Examiners rested with the government of the time, but upon the incorporation of the Association of Ontario Land Surveyors, the appointment of four members of the Board was given to the Council of Management of the Association, the remaining two being appointed by the Lieut.-Governor in Council.

From this it will be seen that the importance of having the responsibility of surveys placed in competent hands has been recognized since the beginning of things in this country, and when the serious nature of the disputes that from time to time arise as to boundaries is considered, there would seem to be full justification for the would-be land surveyor being required to qualify before receiving authority to practice. A preliminary examination, in the absence of a certificate of being a graduate of one of certain institutions of learning named in the Statute, a service of from one to three years under registered articles with a surveyor in actual practice, a rigid final examination, and ultimately the oath of office and the giving of bonds in two sureties, are not too much to ask, when the responsibility of surveying work is taken into account.

The standard in these examinations has been rising from the beginning, and, we hope, keeping pace with the advancement of the

standards in other professions, as well as with the advancement of the requirements in the exercise of our profession. We are told that eternal vigilance is the price of liberty, and the same is true of status. If land surveyors do not keep in touch with the march of progress and put forth constant endeavour to improve themselves in their calling, they cannot hope to be regarded by the public as possessing that competence which is expected of them.

With regard to the earliest surveys of farm lots in this Province, they appear to have been made without any fixed system, but subsequently various systems were introduced from time to time, and in this respect innovations are still being brought in to suit particular classes of country and other conditions. The survey of town plots, inaugurated by the government, has met with similar changes. The standard width for streets in the Town of York, now Toronto, was sixty-six feet, and the regular lots were laid out in square one acre parcels. It is now forcibly brought home to us that while a breadth of sixty-six feet is ample for the majority of streets, those in the central part should be given greater space, and in modern government town plots, the surveyor is required to exercise his judgment in this matter and recommend that certain streets have a breadth of eighty to one hundred feet. If the pioneers of the Town of York could have realized that Yonge and King Streets, for instance, would one day have the demand for traffic space, that is even now required of them, they would no doubt have been given nearly double their present breadth, and the great problem now to be faced as to how best to obtain the necessary breadth at tremendous cost, would have been averted.

Many of us have become accustomed to regarding all city streets as the property of the city, but a recent opinion from an eminent K.C. sets forth the following: "The streets are owned by the Crown —by the public. Take Queen Street, Toronto, as an instance. It was originally Crown land set apart as a road allowance when the lots on either side were deeded to early settlers as grants. The city never had and never will have any right of ownership in that street. It is the same in principle with all streets and roads. They are owned by the public—by the Legislature. The city controls its streets—how? By power vested in the municipality by the Legislature. The city is under obligation to maintain its streets—how? Because the obligation is placed upon it by the Legislature. And all new streets, whether opened by the city or by private owners, at once become the property of the whole public—the Legislature representing the public. As soon as they are opened and registered they are dedicated to the public, not to the municipality. A street anywhere in Canada is the King's Highway, belongs as much

to any British subject as to a local taxpayer. A municipality has, in my opinion, no right to make a profit from its streets, which it does not own. A city may grant privileges of various kinds to people using the highways—for lighting purposes, for street cars, and so on. And all these people have then undoubtedly rights, pursuant to agreement, just as have any other sections of the public. Now, as to defining these agreements, there is only one way of doing so judicially. It does not matter what either party may have intended; the whole question, when a dispute arises, is "What was expressly agreed?" The Privy Council, in deciding such a question, confines itself strictly to what is contained within the four corners of the agreement."

The people of North America have gradually awakened to the fact that the planning of the lay out of a city is a science, which unfortunately in the past has not been invoked, and the irresponsible and uncontrolled laying out of streets and lots by the individual owners of lands, has resulted in serious injury to the city at large. The City of London, England, furnished an object lesson to other cities large and small, when a certain tract was acquired by the Council, the old order of sub-division swept away and a main thoroughfare instituted. The public lands adjoining this thoroughfare became so enhanced in value that it is said the original cost of the enterprise was ultimately lost sight of, and a considerable financial gain to the Corporation was obtained, although the main purpose was the establishing of the thoroughfare in question. The city of Chicago many years ago secured the power to regulate the sub-division of lands in advance of their requirements for building purposes, and projected its streets far into the suburbs, with the result that their ideal of a general lay out became capable of realization. Greater New York also appears to have this advantage, and no doubt other of the larger cities of the United States possess the same. Canadian legislation has been somewhat tardy in this matter, and although a movement set on foot some years ago, largely through the enterprise of Mr. J. P. Hynes, and looking towards a general betterment of Toronto's thoroughfares, has been steadily gaining ground and is now represented by the Civic Guild, no definite results fixed by statute have been arrived at. The Civic Guild, after years of careful study and with the advice of experts from abroad, has devised a general scheme for Toronto, and the probable additions thereto for the next half century. This includes, amongst other things, the widening and extension of certain of the older streets, the opening up of new diagonal thoroughfares radiating from central points, and the projection of main roads in the required directions far beyond the confines of the present corporation. In time it is hoped a permanent commission will be estab-

lished for the purpose of controlling matters of this nature, and in the meantime legislation is being sought to give the municipal councils of all cities in Ontario, having upwards of 50,000 inhabitants, a certain amount of control over new sub-divisions within five miles of their boundaries. The bill now before the Legislature will, if enacted, constitute the railway and municipal board, the tribunal before which all plans of proposed sub-division must pass, and without their sanction such plans cannot be fyled in the Registry Office.

The Registry Act has from time to time been amended and additional requirements as to registered plans, inserted, but it is still somewhat indefinite in the matter of the planting of posts in sub-division plans. This Act now requires that all posts planted in the original survey shall be shown upon the plan, but this amendment although a year old, seems to have escaped the notice of a number of practising surveyors, and plans, where the individual lots have all been marked upon the ground, are still signed for registration, although devoid of any indication as to the existence of posts. As it does not seem to be the business of the Registrar to insist upon information of this kind being placed upon the plan, there is nothing to compel the careless surveyor to give the information the Act calls for. It has been suggested by surveyors, that the surveyor's certificate, might, with advantage, be altered to include the statement that "all posts planted in the original survey are shown thereon."

No surveyor of even limited experience has failed to meet with difficulties which arise when attempting to make re-surveys in sub-division plans, not permanently monumented and where the registered plans are lacking in detail. While the work of monumenting the street lines in the older part of our larger cities is so expensive, a matter that it has seldom been undertaken, it would seem to be high time that legislation is introduced, demanding that all new sub-divisions shall have a sufficient number of their main points permanently marked on the ground, to insure the relocating of street and lot limits within a reasonable degree of certainty. Stone, concrete or iron monuments planted at all street corners or on offsets from the intersecting street lines would not add greatly to the expense of a sub-division survey, and would give a stability as to boundaries, which the purchasers of lots are justly entitled to. Hitherto the owner of the land to be sub-divided has felt no further concern than the marking of the lots sufficiently for the agent to be able to point out the different lots to possible purchasers, but subsequent grading and building operations destroy these original marks and in many cases whole blocks of land are left without sufficient

data to enable the surveyor to establish, with exactness, the position of any boundaries within such blocks.

The preparation of sub-division plans for registration should receive more care than we have been in the habit of giving it. If the field work has been carefully done, the main governing points monumented, courses and lengths given to all straight lines, radii to regular curves, and chords with bearings thereon and ordinates therefrom to irregular curves, a surveyor of the future can enter upon a re-survey with much more confidence than is now the case.

It frequently happens that the bearings given on the boundary lines of carefully surveyed sub-division plans, differ from those expressed in the former deeds of the holdings, and the surveyor making the sub-division is called upon to explain. This he usually does by saying that, finding lines which were given the same courses in the deed, were not actually parallel one to the others, and the actual angles as measured by him differing from those shown by the courses given in the deed, he had adopted a certain main line as governing the courses of all other lines within the plan and deduced his bearings from his measurements, in relation to that governing line. While this is a reasonable explanation, it does not remove all the difficulties in the mind of the searcher of titles at the Registry Office. We have found in practice that astronomic courses instead of hypothetical and deduced courses serve a two-fold purpose. They supply an undisputable explanation to questions as to variations from the deed, and they further render it possible to locate any line within the plan, from any one undoubted original point. The taking of one or more astronomic observations upon a fairly large sub-division, does not involve much additional trouble and cost and it relieves the surveyor present and to come of much difficulty, as before alluded to. Up to the present we are still making use of the old-fashioned way of expressing courses in relation to the meridian line, as for instance "N 16° W", "S 74° E", etc. This method leads to frequent error because of the facility with which the initials N and S, or E and W, get themselves transposed upon plans and descriptions. How much better would it be to substitute the rational method of expressing a course in terms of azimuth. The average surveyor does his field work in azimuths, but unless his returns happen to be made to the Department of the Interior or the Department of Militia and Defence, he is apt to find it necessary to go through all the tedious and uncertain work of reducing his azimuth terms again to the old-fashioned form of expression. I would like to hear the opinion of the Association upon this detail, and if this view is found to meet with general approval,

no doubt azimuths could be introduced both in Crown Lands returns, and in plans and descriptions for the Registry Office.

A trigometrical survey of the Dominion has been entered upon by the Department of the Interior after years of insistence from the land surveyors and others who realize its necessity. Work of this kind is necessarily slow, and we are told that the Ordnance Survey of Great Britain and Ireland occupied more than a century, while the work of amending the survey as changes of features take place, continues to go on. Our Canadian survey will no doubt be prosecuted steadily, and each town and city coming in contact with it should connect its surveys with the lines fixed by the trigonometrical survey. In New York and other cities of the United States, this kind of connection is regularly made and kept up, with the result that all points within the city are geographically located upon the general maps.

As streets laid out in new sub-divisions are intended to become streets in fact, with pavements, sidewalks, sewers and other services for the general use of the public, the engineer for the municipality is naturally one of the parties largely interested in the sub-division. For some years statutory power has been given municipalities to regulate the laying out of streets, and under the powers given them regulations have been framed by certain municipal councils and copies forwarded to all surveyors practicing within their limits. These regulations as a rule deal with the location and breadths of streets and lanes, and in addition require information which will aid the engineer in advising as to whether a street is suitably located. The writer in looking into the methods employed in some cities in the United States finds that contour plans with five foot vertical intervals are made by the city authorities where their powers enable them to regulate the position of streets in advance of requirements for opening up. Until similar powers have been granted to cities on this side of the line, it does not seem a hardship to demand that the owner desiring to subdivide land, submit a plan with contours shown. A further advantage of this provision would be that purchasers have a certain amount of protection against the unscrupulous speculator who may desire to sell lands which are too much broken to be capable of being made into suitable building sites. In the future when powers of that nature have been conferred upon Canadian cities, these duties will no doubt be performed by the City Surveyor or City Engineer.

The re-surveys which a surveyor in a city practice is called upon to perform may be generally divided into four classes: (a) marking out the boundaries of a vacant parcel, (b) title survey, (c) architect's survey, and (d) builders' survey.

The first requires little explanation, as it usually becomes a matter of determining the position of original stakes, and when allowance for any surplus or deficiency is made the marking of the required parcel is proceeded with.

In the second-class the client is usually a solicitor searching the title when a sale or mortgage is being transacted, and it becomes necessary to have a surveyor's certificate that the lands described in the conveyance are free from encroachment and that structures thereon do not encroach upon the adjoining lands. Under this head it becomes necessary to note carefully whether any overhanging eaves, etc., or ancient lights affect the case. With regard to ancient lights, the matter is usually simple, as the Statute creating easements of that nature was repealed some thirty-five years ago, and its repeal prevented the accruing of any easement for light which had not at that time been in continuous existence for twenty years. As restrictions which regulate the position of buildings upon the lands deeded, have to be respected, the surveyor finds it necessary to inform himself as to the details of such restrictions in any case where they exist.

Surveys for architects are becoming more exacting than formerly, as professional men are learning to place the responsibility of different departments where it belongs, and a survey of this kind involves the determining of the lengths of the sides, the angles made by the limits of the parcel, the noting of all irregularities in boundaries due to possessory title, buildings out of perpendicular, etc., elevations of various parts of the parcel given in relation to the City Engineer's datum, and, in some cases, a search at the City Engineer's Department, as well as measurements on the ground, to determine the position and depth of sewers and other services affecting the lands in question.

City Engineers are adopting the practice of fixing their datum in relation to mean sea level, and railway companies and others are following the same practice, with the result that when the use of sea level datum has become general, levels collected from various sources are at once intelligible, without the old time corrections for the variety of datum planes.

The builder's survey is a repetition of a part of the work done for the architect, with the additional work of marking on the ground, not only the outlines of the property to be dealt with, but one or more axis lines. These axis lines are usually laid off at right angles to the front of the lot and at a fixed distance from one front angle or the other, and are used as permanent working lines by the builder throughout the course of his operations. The builder may

also require to have a series of marks placed at various points around the lot at a stated height above his lowest working point or in relation to some fixed governing point or bench mark. He may also require the elevation of the footings of his piers tested, in order that the steel work when applied, will exactly conform to the original plan.

It will be seen from the foregoing that precise work is becoming much more important than formerly, and the surveyor's responsibility is proportionately increased. When land approaches the value of $10,000 per foot frontage, and buildings to the height of sixteen stories are placed upon it, it devolves upon the surveyor to exercise the greatest care in all that he does, otherwise he may find himself dealing with questions that are hard to answer.

With a view to acquiring information on the subject of methods in use in the larger cities in the United States, the writer recently spent some time in research in New York, and came away with a high appreciation of the work done by our brethren across the border. Measurements in that city are made with extreme accuracy, a spring balance being used with the steel band in order to keep a uniform tension. Where the surface to be measured varies materially from the horizontal, the old method of "breaking chain" by the use of the plumb line has been superseded by taking the measurement on the slope and from the angle of elevation or depression calculating the horizontal length. If irregularities in the surface are met with, supports are placed under the tape, after the principle of "boning rods," in order to insure that the tape lies evenly between its extremities. Angles are measured with precise instruments to the fraction of a second and linear measurements are noted to the third place of decimals of a foot. All these precautions have practically banished the old bugbears of surplus and deficiency in New York. The item of temperature also is given due consideration, and while we find that many surveyors in our own land have been in the habit of disregarding variations, experience has taught us that a distance of even three or four hundred feet between fixed points, measured in the depth of winter and remeasured in the middle of summer, does not check. On more than one occasion we have found differences of this nature which were accounted for by allowing for variation in temperature.

The preservation of field notes enjoined by the Statute upon every practising land surveyor, while conferring great advantages upon the older practitioners, brings also its burdens, as each piece

of work involves a careful search of a more or less voluminous collection of previous notes affecting the work in hand.

As intimated at the outset the writer feels that our profession is steadily becoming more important and the duties more responsible, and it rests with the surveyors of the present and future to properly equip themselves and so conduct their practice, each in his own sphere, that the appreciation and respect of the business people with whom we are brought in contact, will wax rather than wane.

Discussion.

Mr. Speight—In farm surveys the regular tariff is from about $2.50 to $4 per acre. I asked them to show me a case in the outskirts away from city property, and where it went out ten or twelve miles from Long Island; in this particular case it was 117 acres, and the surveyor was about a week out there surveying the farm; the work was done thoroughly and he had made a complete traverse, showing his off-set lines and putting stone monuments in. There are no regular lots and most of them are irregular boundaries, and they put in monuments at most of the boundaries; and for this particular survey he got $5.50 per acre and all expenses and board while they were there, and they said they gave them the best wines and the best of everything.

The President—I am sure we are very much indebted to Mr. Speight for this valuable paper.

On motion of Mr. Sewell, seconded by Mr. Watson, the paper was accepted and ordered to be published in the proceedings.

(This Association is not responsible as a body for the opinions expressed in its Papers by Authors.)

TOWN PLANNING.

BY W. J. MOORE, O.L.S., PEMBROKE.

In England and other European countries for some years past a new art has sprung into being, namely, the art of town planning, and the older civilized countries of the world have so turned their attention to it that the results have been ordinances to direct and control civic bodies in their duties. In America the recent Third Annual Conference on City Planning at Philadelphia has given an impetus to the movement for greater scientific study of civic problems, and in Canada the lectures of Mr. Thomas Mawson of Liverpool have awakened an interest not hitherto felt. That the subject should be one deserving of the close attention of surveyors would seem to be self-evident. The Hon. Frederic C. Howe, of New York, in a recent paper says: "City planning is fundamentally a land question. We can see this in Washington, where the city was originally designed by Major L'Enfant and President Washington in an unbroken country." If this is so, as I have no doubt it is, it follows that land surveyors have a right to take an interest in the study of this new art and combine their efforts with those of architects and civic reformers everywhere to further the advancement of knowledge concerning the problems to be solved. It would, therefore, appear that a paper on this subject would be quite in order at a meeting of land surveyors.

Most people who have given the subject any thought are agreed that an up-to-date town plan is desirable for any city. The rapid advances that have been made in the arts and sciences and the spread of the manufacturing industries, together with the remarkable inventions and the excellent transportation facilities of the present age have all tended to increase the size and population of the cities. But with this increase has come an increased responsibility to the municipal representatives, which in many cases they are not fitted to assume. Every city of consequence has its slum problem. Every city has its problems of sewerage and of water supply, its necessity for regulations to govern prospective builders as to the class of buildings which shall be erected in certain dis-

tricts, its regulations for safeguarding the public health, and the numberless problems that have to be solved to make it an ideal place to live in. Now under our system of municipal government, the policies by which all these civic affairs are controlled are just as liable to change as is human nature, and one of the uses of a town plan is the crystallizing of the broad principles underlying these problems into ordinances for the public welfare. But we, as a body, are more interested in how the division of land can affect the future welfare of a city, and as a preliminary to a study of this let us observe how the growth of the average Canadian town progresses.

The site of the town which we will consider is first traversed by the prospector or lumberman. Then comes the land surveyor, who proceeds to subdivide the township. He is followed by the pioneer, who settles on the land. Possibly he settles on a lot at the confluence of two streams. One of the streams may have a water power, and for his own needs and the needs of others he establishes a grist mill or a saw mill. The mill is followed by the store, and the store by other buildings, and it is brought to the consciousness of the pioneer that he has here an embryo town. He is seized with the idea that village lots will sell better than small detached parcels of land, and accordingly the surveyor again appears on the scene. He makes a survey according to the instructions of the owner and files a plan to which he certifies as having been prepared in accordance with the provisions of "The Registry Act." The only regulation with which the owner has to comply is that the streets must be at least 66 feet wide, unless special permission to make them narrower is granted him by the township council. Now, owing perhaps to natural advantages of situation or the requirements of trade or transportation, the influx of population may be great, and as the population thus increases the number of subdivisions increases until there arrives a day when these people desire to manage their own local affairs independent of the township. Accordingly a petition is presented to the Legislature and a certain area named, and if the petition is granted the village now becomes a separate municipal entity. I think that this is the proper time to start town-planning. When an owner desires to build a house he does not build his foundation and then go to an architect for a plan. When a railway company desires to build a railway it first sends its engineers on a reconnaisance; then the preliminary survey is made; this is followed by the location survey, and this in turn is followed in many cases by the survey for revising the location. All this is done before construction starts, and the company then is assured that for its requirements the line as located is in the best possible place. This is the policy of individuals and also the policy

of progressive companies. But it has not been the policies of our villages, towns and cities. They have been allowed to grow in a more or less haphazard manner, notwithstanding the fact that the capital represented by their streets, street improvements, civic buildings and so forth is enormous. With regard to the general features of a town-planning system, different authorities differ on the most of them. The subject is of such magnitude and so young yet that no definite principles stand out without the liability to challenge. Different countries present different conditions, and even in the same country there may be two cities that require totally different treatment, so that it is recognized that each place must be studied with regard to site, provincial laws affecting it, the character of the place itself as to whether it is a manufacturing centre or a port, a mart of commerce or a sober educational town. These things and many others affect a town-plan, but there are certain opinions which are generally upheld. One of these is that the gridiron method of laying out a town is wrong. The objections to this are both from the point of view of utility and of aesthetics. The well-known principle of geometry that any two sides of a triangle are together greater than a third is applicable here in an argument in favor of radial streets extending from some business or civic centre to the outskirts. These would afford a direct highway for traffic. On the aesthetic side it is claimed that in residential districts too much of a sameness obtains, that no really fine sites for "show buildings" present themselves, that there are no pleasing vistas terminated by notable structures; that, in short, the gridiron plan of streets is extremely inartistic.

Another necessity has been met by the division of streets into classes and the standardizing of street widths. The standard widths of the London Traffic Commission are:

Main Avenues	140 feet
First-class Arterial Streets	100 feet
Second-class Streets	80 feet
Third-class Streets	60 feet
Fourth-class Streets	40 to 50 feet

Some cities again have, besides the wide radial streets, circumferential streets of ample width, and generally with trees and boulevards. Vienna is an example of this.

To successfully lay out in advance a system of streets that would be suitable to posterity one would need to have the gift of prophecy, and as this is denied the majority, it is necessary to study the site and from known conditions try to deduce the probable later

conditions and plan the streets accordingly. In many places a city is divided into zones. One district, then, would be set apart for factories; another would be set apart for residences, over which certain restrictions are exercised; another for residences with restictions of a different nature, and so forth. This division into zones is, therefore, an aid in planning streets and lots. This then brings us to the consideration of what shall be the size of a lot.

It seems to be pretty well established that for a healthy community the householders should be in a position to obtain plenty of light and air. One expert gives it as his opinion that the lots on which are situated the houses of the poor should be only 25 feet in depth, with a street at both the rear and the front, the houses being built closely side by side and extending from street to street. This, in his opinion, would prevent the back-yards from being filled with garbage and be a more satisfactory arrangement than at present exists. It seems to be the general idea, however, that the owner of each cottage, however poor, should have an open space in front of his home and a garden at the back. The general depth of the lots in America is from 125 feet to 150 feet. In some cities minor streets are run at the rear of lots and, if kept clean, are a great convenience.

Much more could be said along these lines, but I am going to turn my attention to what I believe would be a rational way to approach the subject in Canada. We as a nation are young and have not the experience of the older nations, yet we have experience enough to know that many mistakes in the lay-out of our towns could have been avoided by a little intelligent forethought. At the intersection of King and Yonge Street in this city the increasing traffic is making the rounding of these corners a practical necessity. Ten minutes of a surveyor's time would have accomplished this originally. The other day the town of Aylmer, Quebec, passed a by-law prohibiting the piling of lumber inside the town limits after 1913. Last year that town was nearly wiped out by fire in the yards of The Ritchie Lumber Company.

It will be agreed then that as "town planning is fundamentally a land question," and any mistakes in subdivision are difficult to rectify in later years, the time to begin is when the town is young. The initiative would seem to lie with the Legislature. A Town Planning Act is necessary, which would provide that as soon as a town becomes incorporated a preliminary survey should be made of all the lands within the boundaries. Levels should be taken referring to some datum such as sewerage outlet or low-water mark and permanent bench-marks established. A contour map

could then be prepared, upon which could be drawn the streets and lots in a manner suitable to the contour of the ground and in accordance with the various governing conditions of the site. Open spaces and parks could then be designed in the most suitable locations. The owner would have to be restricted from building on these streets and open spaces and would be compensated for them or specially assessed according as the benefit was from him or to him.

These remarks are just suggestions. In England there is a Town Planning Act, which is in the experimental stage. In Germany many cities have carried out great schemes along similar lines, and in the United States Washington stands as an example of what a town plan may accomplish. The movement is certain to affect Canada, and there is every reason to think that when it does surveyors will find it a subject of interest and profit as well.

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RE-MARKING GOVERNING LINES.

BY FRASER AYLSWORTH, D.L.S, MADOC.

An experience extending over twenty-five years as an Ontario and Dominion Land Surveyor should give one a pretty good knowledge of the conditions for surveying in those districts in which he has been practising. This experience has taught me that surveying in those townships that were amongst the first surveyed townships of the Province is not "a thing of beauty and a joy forever" in many instances.

I propose, therefore, to ask this Association to place itself on record as favoring "The re-marking of governing lines by the Departments of Lands, Forests and Mines." This does not mean that our work will be completed by the re-marking of the governing lines, but rather that we will plead for that much as the first instalment, and that our work will not be completed until we secure the re-marking of all the corners in all the Province that have not already been marked by permanent corners. Therefore I will plead for your co-operation to-day to go about it according to the European plan—that is, if our resources are small, let us order accordingly.

I think that the first surveys of townships in Ontario were made about the year 1784, about one hundred and twenty years ago. All corners in those townships were marked with wooden posts—not over carefully selected for their durable qualities, the exception being that trees were sometimes used for a corner marking. As we are all only too well aware, all those original wooden corner markings, with only a very occasional exception, have long since passed away. All the pioneer settlers who knew of those posts and corners have also passed to their last reward, and with them the only trustworthy source of evidence as to the position of those original corner markings. The exact position of the great majority of those original corners will to all future generations be uncertain. Running concession and side lines in the older portions of Ontario is not surveying any more. The chaining and instrumental work

is now only the kindergarten feature of the process. The surveyor must now be an artist in research, skilled and well balanced in the taking and sifting of different forms of evidence, together with being an indefatigable, skilful and resourceful detective, and for odd occasions the modern surveyor will not find it amiss to equip himself with a smattering of the pugilistic science for defence purposes. With all those equipments the surveyor is continually guessing as to how to establish lost corners in those old surveyed townships. In the district where your humble servant resides I know of a continuous distance of thirty-six miles of governing lines on which there are not more than three or four posts from which a surveyor could make an accurate commencement for the three townships included in that distance. In other townships a surveyor is compelled to run many miles of governing lines in order to get the bearing to run the side line by in a given concession. Even then the surveyor is not fully satisfied with the completeness of his survey, as it is all becoming now so dependent upon the pros and cons of evidence that a surveyor never knows when some new evidence will put in an appearance which has the effect of reversing his previous decisions.

Last summer I asked a Manitoba Land Surveyor why he left Ontario, where he had obtained a license. He replied: "The exasperating uncertainties concerning the location of lost corners was too much for me. Any four-corner lawyer by reading over the Survey Act and then cross-examining the surveyor as to the legality of his survey could make the latter feel that the bottom of the witness-box had many large holes and that he was about to drop through them all, so I came where the original surveys were of more recent date, the corners more permanently marked, and the surveyor was not required to be merely a detective." I employ that statement as a comparative illustration. Therefore I think that the time has arrived when this old, well-settled Province of ours should make a beginning to place the surveys of those early-surveyed townships on a sound and permanent basis before it is too late, because re-surveys in those townships are becoming more difficult every day.

In Manitoba surveys such as I am appealing for are called "special surveys," and with all the boasted permanency of the original surveys of that Province "special surveys" are continually being made there. The city of Winnipeg is under "special survey"; the Saskatchewan trail, leading from Winnipeg to Portage-la Prairie, is under "special survey"; the trail leading from Winnipeg to West Selkirk is mostly under "special survey," and many other special surveys in Manitoba could be mentioned, but space

need not be taken to enumerate them here. Surveyors there form a merger privately and refuse to make surveys for private parties in those districts where the original lot or section corner markings are gone, and then the Government of that Province, acting under an Act in that behalf, steps in and provides the relief in this respect, namely, re-marking the corners and providing that they shall govern all future surveys. Winnipeg surveyors are delighted with the advantages of their special survey. Manitoba Land Surveyors are delighted with the advantages of the rural special surveys and commend them in highly eulogistic terms as the forerunners of better professional harvests.

Let us urge the importance of a beginning and not discontinue our efforts until a special survey covering the townships surveyed into single and double-fronted concession is assured.

Not only that, but more permanent corners should be erected in the townships now being surveyed in this Province. What's the matter with surveying the great clay belt of Ontario, with the corners marked as permanently as the corners are being marked in the great Peace River district, which is now being surveyed by the Dominion Government? Why should the corners in the Peace River country be each and all marked with iron posts and pits or mounds and the corners in our great clay belt be only marked with wooden posts and an occasional iron post? Let us have permanency in these matters all around. Whatever is worth doing at all is worth doing well. An irregular line marked permanently is preferable to a straight line marked with temporary corners only. I believe a little advance has been made and some iron posts are now used in this Province to mark corners in the townships that are now being surveyed, but otherwise corners are being marked in the same old way that they were 127 years ago. To mark the corners in the townships now being surveyed with iron or stone corners would certainly add to the cost of the survey. But are not the settlers in our Ontario clay belt entitled to have their corners as permanently marked as those of the Peace River district. Progress has been made along almost every other mentionable line, but in the marking of survey corners of Ontario—little. Eight iron posts are now used to mark corners in townships six to nine miles square, and some mentioned soft woods are now excluded for use as corner posts.

Sec. 16 of the Ontario Survey Act enacts that "all boundary lines of specified areas, and all trees marked in lieu of posts, and all posts or monuments marked, placed or planted shall be the true and unalterable boundaries," etc. This means for all future time.

How can it be said that these corners and boundaries are unalterable while they are only marked by wood, and not always the most durable quality of wood available at that?

The Dominion Government has been and is now re-marking the corners permanently over great areas of the Western Provinces where the corners had originally been marked with wooden posts.

There is an impression amongst constructive and thoughtful leaders in sociological science that the present recognized movement and reversed and that a "back to the land" movement would be of the rural population into the urban districts should be checked the solution of present unsatisfactory conditions. When such an ideal has been recognized and when there is a "back to the land" movement in the interests of national manhood development, then Ontario lands will increase in value, holdings will become of smaller areas. But where will surveyors look for corners to again subdivide the farms?

You may reply: If you survey the governing lines and mark the corners permanently you will be depriving the surveyor of his daily bread. In reply I beg to respectfully state that from the experience of those who know the contrary is the result—that more surveys and better results accrue from the permanent marking of corners.

By having the corners indisputably remarked many probable elements of future disputes will be eliminated, more surveys will be made by people who are now in fear and trembling lest a much-desired survey made under present conditions would pave the way to an interminable costly lawsuit.

By members joining in an aggressive movement for such a forward and progressive step it would place all our members on the firing line. Such a movement should appeal to old, experienced surveyors, because it would result in more surveys to them, and to the young surveyors because it will result in more future surveys, which can be made by a more satisfactory process.

Yes, some may suggest, such surveys as I have appealed for would be very desirable, but where is the price of them to come from? Well, there is no object in discussing ways and means for financing such a survey if we do not decide that they are desirable or necessary.

Then, again, someone may ask, What other provinces or countries are carrying on such a survey? The Province of Ontario has the largest population, is the greatest agricultural producer, is the leading manufacturing Province, is the leader in commerce and finance, is the leader along educational lines, is the leader in the application of scientific methods, so why should not her Association of Pathfinders be the leader in survey methods?

Let us unfurl the flag of progress from our Association pole. It will give us something to yell for, to fight for, and arouse an educational campaign worthy of our metal.

All of which is respectfully submitted for your careful consideration.

Discussion.

Mr. Speight—Mr. President and Gentlemen, I am sure you have all listened with a great deal of interest to this excellent and practical paper by our good friend Mr. Aylsworth. There is a great deal of food for reflection and a great many good suggestions in it. I think it has been extremely interesting to every person here and it is a practical paper and one that is highly entertaining, I have great pleasure in moving a vote of thanks to Mr. Aylsworth for this very excellent and practical paper.

Mr. Ardagh—I have great pleasure in seconding the motion.

The President—I can only add that it is worthy of Mr. Aylsworth.

Mr. Ardagh—I agree with every single word that is written in that paper. I am in the County of Simcoe and I hope when they commence that they will commence in the County of Simcoe.

Mr. Dobie—There is a lot of good sound common sense in what Mr. Aylsworth has said, and he did not need to confine his remarks entirely to the older sections of the Province, because the same conditions obtain very largely where surveys have been made 30 years ago. I know of cases in Northern Ontario where Townships have been surveyed within 30 years where it is practically impossible to make a survey now. I know myself of people who want surveys made and who won't have them made just for fear of legal entanglements that may come afterwards. I have been approached myself to make surveys and I wouldn't make them on that account. I always try to fight shy of lawsuits if I can. If this principle be once started it will gradually spread over the whole Province and it will be a good thing for the public and for the Province.

Mr. van Nostrand—There is one disadvantage I would like to point out, and that is that when, for instance, the County of Simcoe is dealt with in that way then a vast amount of data for the question drawer of the Land Surveying Committee will be done away with. That has from year to year been one of the chief and most valuable features of the meeting, and if we are not going to have any question drawer in Land Surveying in the future I am afraid our attendance may be limited. We are very happy in having a large attendance this year, and I think it is very largely with the idea of having that question drawer thoroughly threshed out.

Mr. Beatty—While we have the hearty concurrence of the members of the Association as to the principles of this it seems to me in order to derive any benefit from the suggestion it will be necessary to take some steps towards carrying out the suggestions brought to the attention of the Government. Now, it is a serious question to us back country surveyors to have these corners re-established. I know up in my country there are not only parts of the township, but township after township where it is absolutely impracticable to go to-day and make a survey that is worth a cent. I know where concession line after concession line is completely obliterated, and some poor farmer back in there, that the country is very glad to have in there, can't afford to get his line run. Surely to goodness if our government are passing resolutions and adopting schemes to get settlers from foreign lands, they should take some means to provide those settlers with a means whereby they can have their lands surveyed without its costing them more than their farms are worth. They either should do it or prohibit them going in there altogether. I know lawyers and doctors have come to me within the last two months and have asked for certain surveys and I have told them, I can't make any survey in there that is worth anything to you. They think that is a pretty funny state of affairs. They would ask, what would it cost to run that line? And I have said, Well, it might cost a couple of hundred dollars. I would move that the Council be authorized to present a memorial through the Survey's Branch to the Minister of Lands, Forests and Mines, and have this brought to his attention and have it explained to the Minister that we are seriously in earnest, and that this thing, although it is only mentioned now, has been bothering us for years, and that we want some action taken. The Dominion Government is spending large sums in re-surveying and there is no reason why a wealthy Province like Ontario can't spend some money in re-establishing these old corner monuments. It is not as if it was only a matter of advantage for to-day or to-morrow or for ten years, but it is forever.

Mr. Murphy—It is very desirable to have that done, but we don't want any more machinery or any more petitioning. The machinery is there already. There is a very good class of surveys that I don't hear very much about now, called municipal re-surveys. I know gentlemen who have been practising for years who have done bushels of them. You can find the whole machinery. All you have to do is get a petition to have that thing done, and I believe it is done at the Township expense, not at some individuals expense.

The President—My experience is this, in those new townships where they are struggling away even to get a little school started that the settlers can't even take advantage of the Municipal Act to get a survey made. There are hundreds of those cases up in the northern country. To make a re-survey of the whole Township they have to pay the cost of the whole survey.

Mr. Murphy—I knew every word Mr. Aylsworth has said is true. I have gone for miles and miles along the base line and I couldn't find a piece of stick or stone that a person could swear to that I could recognize as a corner. It is really laughable. You tell your client to bring forward the evidence and he brings a lot of old gentlemen who are blind or deaf and it doesn't amount to anything. They say, You better see old Mr. So-and-so, he is somewhere around Toronto or lives in Hamilton or Peterboro. I remember once after chasing about six or eight miles along the base line I was recommended to go to an old surveyor, and I went to him and all his information consisted of a so-called astronomic bearing which I think had been taken by the sights of the compass. The machinery is there to do this kind of thing and all that is necessary to be done is to do it, at the township's expense.

The President—You can't do it at the township's expense where there is no one in the township to pay for it.

Mr. Murphy—The machinery is provided how it is to be paid and all that.

The President—The difficulty has been in so many places in Northern Ontario that the settlers in going into the country can't find their lots and there is a great deal in what Mr. Beatty says that many a man has started out to look for land owing to the difficulty of finding his corners, and having no desire to run up against a lawsuit, he has left the township altogether. I know of several cases in the last two years where that has occurred, more particularly in the vicinity of Port Arthur. It was surveyed away back about 1871 and fires have since swept over the country and there are large townships to-day that there is not a settler in and

I believe it is because the lines could not be found; and I think the only remedy is to bring it to the notice of the Government. I don't think that such surveys should be carried on as municipal surveys. It is far cheaper to make a re-survey and ignore the old lines altogether, and that could be done before the settlers go in. After the settlers go in then it might be found more difficult.

Mr. Murphy—There is something in what has been said with reference to having this done in a sort of progressive way. Now, you won't have to go more than five to ten miles away from the City to find just such cases as I have been speaking of and there is simply nothing done. All the lines that should have been run are settled down into title by possession and so on. But, as far as these outlying northern country places are concerned, I have been told by the men that work up there that the lines are obliterated after a few years; and in the course of settlement I think it is the duty of the township, not to do it all at once, but, as time goes on to keep replacing corners so as to keep the thing up-to-date. The machinery is all there; the Municipal Act is very good. I can't see any person that the expense should fall on except the municipality.

The President—On the Government.

Mr. Ardagh—I tried very recently to get the township to act and had to tell my clients that they wouldn't act, there were not a sufficient number of people there who cared about their lines. A lot of them were absentees and the men that were there were interested but they couldn't get anything done at all. I couldn't make a proper survey and I told them so. I said it would cost hundreds of dollars and even then it would involve all kinds of disputes.

Mr. Aylsworth—As to the powers of the Survey Act in municipalities, it is not popular, it has not been acted on, and in running these government lines the people living along the lines do not take any interest in them, they are satisfied. If the surveyor wants them to run a line away up in the middle at the back end of a concession the people living along it are not interested, they won't take any action. It is only for the Government to do it now. They surveyed it in the first place and didn't put in permanent monuments, they are responsible.

Mr. Beatty—There is one reason why the Government should re-establish these surveys. A great portion of the land in the Province is timber land, and they gave these lumbermen license to go in there and cut the timber and they obliterated all traces of the

survey, and the Government got the money out of it and they have a right to re-establish these lines.

Mr. Gibson—Away back in 1837 my father knew all the old points and he proposed to the Council that they should have these lines re-established, just as Mr. Aylsworth says in his paper, but they said, Oh, no, you just want a job. There is no doubt that the Municipal Act provides all the machinery, but it is in the hands of the Council to order it and they won't do it.

Mr. van Nostrand—I have much pleasure in seconding Mr. Beatty's motion. I would suggest also that the Council be not only authorized but instructed to memorialize the Government on this subject, and before doing so it requires very serious consideration. If we are going to establish a new set of machinery it should be machinery that will operate and operate at the will of those most interested. Those who have had to deal with municipal surveys all know the difficulty which Mr. Gibson has just pointed out in having the Council take the matter up. The Act is definite that they may do so upon requisition of a certain proportion of the land owners affected or upon their own motion. Now, that thing in the practical working out means that the Council will not take upon themselves any responsibility that will tend to make them unpopular. We all know a municipal survey is a most expensive thing; no surveyor can make a proper municipal survey without going to the very root of everything, and his bill eventually is a large one and unfortunately largely composed of disbursements by himself. At the same time the bill falls very heavily upon the owners of the land affected. In that way the municipal survey falls to the ground. Now, in this new propositioin I had the privilege of going into the subject matter with the author of the paper some time ago about the time the Duke of Connaught was here and I quite agreed with him about the desirability of it but I was somewhat at a loss to know how it could be worked out or how machinery would be made more easy of operation than the present machinery which we have. There is no doubt in the mind of anyone present as to the desirability of having those corners fixed and having it so that a man may have his farm surveyed and yet not have to mortgage it for that purpose. If the council of management can devise some scheme that will appeal to the Government themselves so that they will take up these individual cases on their merits and relieve the people affected of the greater part of the financial responsibility I am sure it will be workable and it will be a move in the right direction such as we have not seen for a long time. So that I think if Mr. Beatty is willing we might add the words that the Council be not only authorized but instructed to memoralize

the Government and in that memorial it must be made clear how it should be worked.

The President—Do I understand that this is to apply to the old settled townships?

Mr. Aylsworth—Yes.

The President—To all townships?

Mr. Aylsworth—The older they are the worse they are.

Mr. Gibson—There is one difficulty in the way. Ten years' possession holds the land. How provide for that?

The President—I think in attempting too much you will spoil your chances altogether, because the difficulty in the government going into the re-survey of an old township is the number of law-suits they will stir up. If that was confined rather to townships which are thinly settled it would have a great deal more effect than taking in all classes of townships. That is my private opinion. I don't think any government would undertake at the present time the duties of re-surveying old townships that have been settled for 50 or 100 years.

Mr. Beatty—I would not suggest that the Government be asked to re-survey a whole township but only the portions where there is great difficulty to-day in getting anything to start from. Now, take South Renfrew, in the Township of Halton, it is old settled valuable land and wealthy farmers in some parts, and there are other parts in which the land is coming into greater value than it was estimated at a few years ago, and to-day in certain parts of that township you can't get anything to work from. Re-establishing is simply out of the question. The township was originally surveyed and nothing but compass lines were run. You go up against a town line and you can't find where the town line is and you can't find out definitely the width of the road allowance. Some people claim it is 66 and some 99 feet wide, and the old settlers are dying every year, and every year the evidence is going that we should take advantage of. The Government would not act in every case that was presented to them indiscriminately; they should get some good reason why this should be done and exercise their discretion as to whether they would undertake it or not.

Mr. Gibson—In the Township of Etobicoke there are any amount of stone monuments planted, and on re-survey, municipal surveys they never move the lines at all. You can't compel them to move their lines.

The President—There have been several petitions filed with the Government during the past ten years from the settlers in the newer parts of Rainy River District and up in Algoma, and the question always came up in this form, these settlers cannot afford to make their survey under the Municipal Act. The land is all taken up; and in all cases like that nothing was done; but there are many other cases where the new settlers are going in and they can't find their lot lines and they are unable to pay for such a survey, and we have made several re-surveys within the last ten years of small sections or parts of townships.

Mr. Smith—Mr. President, I am like Mr. Aylsworth. I have had a good deal to do with those things. I suppose 30 years ago I came to the conclusion that if we had our governing lines defined half the trouble would be done away with. In the old double front townships or the old system of surveying single frontage, if we could get anything done to define the governing line it would be very helpful, and it would be a great advantage to the profession. It is a question of getting the astronomic bearing.

The President—If you are in a well settled township you can do that under the Municipal Act.

Mr. Smith—I know that, but unfortunately, the difficulties are in different parts of the township. For instance there is a piece of land away in the eastern side of the township and it is good land and you can find the line, but on the western side no human intelligence can find it. In my 30 years' experience that is where I have found the greatest difficulty.

Mr. Aylsworth—I think every year the Government of this Province sends out 15 or 20 parties surveying. Why not add four or five more parties to go through the settled parts of Ontario to carry on the re-marking of the governing lines. Some say you can't change the lines on account of adverse possession. When a surveyor is taking his bearing he does not take adverse possession into consideration at all. He has to find the old post or go on to the next corner. The fence may be here and the original post you may find over there. Adverse possession counts but a surveyor can't be guided by it. So far as making a sub-division survey he cannot go by adverse possession. I say they could commence just as they are carrying on the geodetic surveys in the States, and carry it on year by year. Let us make a start and get the thin edge of the wedge in. At present some settler may be dissatisfied with your survey, he will bring on another surveyor and they will have evidence rustled up or hustled up from some place or other and brought to disprove your survey.

Surveyors are familiar with these things every day. Let us get this survey matter started and go at it in a methodical way and have four or five parties sent out every year to do this work and establish the corners.

The President—I think the motion is in the right direction. If there is any possible way of urging it upon the Government I don't think there is any resolution too strong. I would like to see Mr. Beatty's motion adopted if someone will second it, and then the question is as to how that memorial to the Government should be presented.

Mr. Fitzgerald—Perhaps Mr. Aylsworth would give us some information as to how Manitoba does it. We might take a leaf out of their book.

Mr. Aylsworth—That was one of the points mentioned I was deficient in, in my paper, because I haven't got the Statutes bearing on Manitoba surveys. I don't know how the costs are distributed. But, those things are all available and if we appoint a Committee to go into this subject they can procure all this information.

Mr. Beatty—Is it not generally known there are a great many re-surveys being made by the Dominion Government?

The President—They are re-establishing a great many monuments in sections that are not settled at all.

Mr. Aylsworth—I have been engaged in the North-west in such surveys for 15 years, making re-surveys and re-marking old corners where we could find them, and up to a certain date we have been establishing the lot corners in all the old settled parts of Manitoba, especially on the east side; and they are carrying on that same work up in Alberta and out in Saskatchewan. After this is done there is no more trouble. I think some steps should be taken towards eliminating some of this trouble before the thing goes too far.

The President put the motion proposed by Mr. Beatty, seconded by Mr. van Nostrand, which on a vote having been taken, was declared carried.

(This Association is not responsible as a body for the opinions expressed in its Papers by Authors.)

GEODETIC SURVEY OF CANADA.

BY THOS. FAWCETT, D.T.S.

By permission of Dr. W. F. King, C.M.G., Director of the Geodetic Survey of Canada, I am able to compile a table showing the geodetic positions of a number of the stations established and occupied by the Geodetic survey staff. The primary stations, and a few secondary, have been so far occupied in the settled parts of the country that the geographic positions of these points have been computed from the city of Quebec to about Belleville, Ontario. Each station is given the same name as the township in which it is located, and as the scaffold from which the observations were made are in many places intervisible during daylight with an ordinary transit telescope,—Surveyors in the vicinity of these stations might find a table giving the latitude, longitude, and astronomical bearings between stations very convenient for use in adjusting their local surveys. For the purpose of adjusting the figures in computing the co-ordinates the triangles have been collected into groups or nets as shown by stained lines on the accompanying sketch, the whole figure being adjusted together. The first net shown in Ontario extends from the interprovincial boundary on the St. Lawrence River to Ottawa, and the next group takes in the country to points west of Belleville. The computations are still subject to a slight revision, but changes will not effect the results given in the table except perhaps in the third decimal place of the second column so that for all practical purposes the positions given may be considered, absolute. The points denoted on the sketch by small capitals were determined by secondary triangulation. Horizontal directions have been determined along the same belt to points west of Toronto and stations are ready for occupation covering all the western peninsula of Ontario and in two or three years at most the primary points will have been established covering the thickly settled portions of our province.

Precise levels have been carried from the extreme east along the railway line to Windsor and also branches to Owen Sound and other points. Copper bolts for permanent bench marks have been set in the rocks, walls, bridge abutments, public buildings, and other points where they may be accessible for future use. A list of those benchmarks, describing each point, with the elevations, would be of great value to our surveyors, many of whom are county, town-

ship or town engineers. A uniform datum plane to which all levels throughout the province might be referred would be very valuable inasmuch as the elevation of one part of the country could be compared with that of another without in every case when the information should be required running a line of levels between them. A table giving full information as to the elevations determined by the precise levelling parties in Ontario, the bench marks established by them and all necessary particulars could undoubtedly be obtained through an application to the Director of the Geodetic Survey, Dr. King, Dominion Observatory, Ottawa, and might be published in pamphlet form at the expense of the Association for the use of our surveyors.

I hope the information which is obtained with such great care relating to the geographic positions of points and precise elevations, will become accessible to all persons who can make use of it at the earliest possible date after such information is acquired. Much valuable information lies buried in the official reports of the Government, and is never seen by many persons to whom the information would be most valuable—not to the individuals only but to the country. Take for example the reports of the geological survey. How few of them are even outside of that department, and at a time when hundreds and thousands of people are deeply interested in the mineral wealth of the country and in search of new fields for exploration. Members on the staff of the Geological Survey make expeditions year after year to the unexplored parts of our country, make notes of its topographical features, its rock formations and mineral deposits, its flora and fauna and the information is printed in reports and carefully stored away to be discovered perchance by future generations. The new branch appointed for the conservation of our natural resources may bring some of these things to light. If so, provision should be made for publication of the reports in a form for distribution to those persons interested who might apply for them. In the appended tables the latitudes and longitudes were checked by computation from two or three points of which I have given one. The astronomical bearing given in from the station noted first. If the bearing should be required from the station at the other end of the line the correction for convergence of meridians would have to be taken into account. This correction is readily found by multiplying the difference in the longitude of the two stations by the sine of the mean latitude. This convergence added to, or subtracted from, according as the direction is toward the east or west plus or minus 180 degrees will give the astronomical bearing at the other end of the line for all practical purposes.

Place	Computed From	Latitude			Longitude			Azimuth		
		Degrees	Min.	Sec.	Degrees	Min.	Sec.	Degrees	Min.	Sec.
								Plantagenet to Maxville		
Plantagenet	Vankleek Hill	45	30	08.74	75	03	21.80	140	18	00.77
								Maxville to Bonville		
Maxville	Vankleek Hill	45	17	46.45	74	48	49.76	185	05	12.42
								Buckingham to Navan		
Buckingham	Plantagenet	45	37	51.21	75	25	20.03	174	27	56.05
								Navan to Plantagenet		
Navan	Plantagenet	45	26	10.26	75	23	43.56	74	22	29.34
								King Mountain to Navan		
King Mountain	Buckingham	45	29	24.29	75	51	49 58	99	07	14.63
								N. Mountain to Roxboro		
North Mountain	Navan	45	04	13.80	75	32	54.50	67	48	40.70
								Lavant to North Elmsley		
Lavant	King Mountain	45	02	47.41	76	40	10.69	101	22	33.52
								N. Elmsley to N. Mountain		
N. Elmsley	King Mountain	44	57	50.92	76	06	13.46	74	41	30.36
								Olden to Crosby		
Olden	Lavant	44	44	31.94	76	50	20.59	100	22	52.64
								N. Crosby to Lansdowne		
N. Crosby	Lavant	44	41	18.42	76	25	59.72	121	41	44.713
								Portland to Lansdown		
Portland	N. Crosby	44	26	02.36	76	38	19.93	82	10	59.04
								Grimsthorp to Kaladar		
Grimsthorp	Olden	44	42	23.46	77	25	16.18	108	08	24.87
								Kaladar to Olden		
Kaladar	Olden	44	38	32.16	77	08	52.37	65	29	24.02
								Tyendinaga to Portland		
Tyendinaga	Kaladar	44	20	09.55	77	12	02.83	76	08	04.09

Place	Computed From	Latitude			Longitude			Azimuth		
		Degrees	Min.	Sec.	Degrees	Min.	Sec.	Degrees	Min.	Sec.
								Murray to Hallowell		
Murray	Grimsthorp	44	07	25.55	77	39	55.60	102	20	03.61
								Ameliasburg to Murray		
Ameliasburg	Murray	44	00	51.68	77	28	44.24	309	11	56.21
								Presquile to Ameliasburg		
Presquile	Ameliasburg	43	59	55.78	77	40	35.59	83	43	04.28
								Huntington to Rigaud		
Huntington	Rigaud	45	05	36.78	74	15	15.68	355	01	11.24
								West Base to Newton		
West Base	Rigaud	45	13	35.12	74	19	59.15	336	19	57.91
								Covey Hill to Huntington		
Covey Hill	Huntington	45	01	07.85	73	47	46.16	283	06	55.42
								Royal to Huntington		
Royal	Huntington	45	30	34.40	73	35	25.19	228	38	27.14
								Bonville to Huntington		
Bonville	Huntington	45	07	36.02	74	50	06.51	94	23	55.48
								Alexandria to Huntington		
Alexandria	Huntington	45	16	25.01	74	37	34.04	124	16	23.90
								Maxville to Bonville		
Maxville	Bonville	45	17	46.45	74	48	49.76	185	05	12.41
								Roxboro to Bonville		
Roxboro	Bonville	45	13	22.13	75	00	56.72	126	53	57.62
								Elizabethtown to Mount'n		
Elizabethtown	Mountain	44	41	25.85	75	42	19.36	16	18	23.23
								Lansdo'ne to Elizabetht'n		
Lansdowne	Elizabethtown	44	29	42.65	75	59	52.32	46	50	02.08
								Hallowell to Portland		
Hallowell	Portland	44	02	02.53	77	06	19.32	39	49	18.25
								Sidney to Tyendinaga		
Sidney	Tyendinaga	44	13	58.93	77	33	52.65	68	22	29.82

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A SHORT DESCRIPTION AND HISTORICAL SKETCH OF ALASKA, WITH THE DIFFERENT TREATIES DEALING WITH ITS BOUNDARY, AND WITH SPECIAL REFERENCE TO THAT PART OF IT DEFINED AS LYING ALONG THE 141ST MERIDIAN.

BY FREDERICK LAMBART, D.L.S.

In considering the survey of the 141st Meridian, with which this paper is specially to deal, it seems desirable at the outset to give a brief descriptive and historical sketch of Alaska, and as well to make a reference to the several treaties leading up to the final Award of the Alaska Boundary tribunal of 1903. Alaska, which contains 586,400 sq. miles, is situated at the extreme north-western part of North America, and its boundaries separate it from our province of B. C. and the Yukon Territory. Its coast line, washed by the Arctic and Pacific oceans, following the heads of the bays and inlets is 26,000 miles long, exceeding in length the girdle of the earth; the range in longitude from the head of the Portland Canal to the end of the Aleutian Islands is considerably greater than from New York to San Francisco. The coast line of the south-eastern part of Alaska is very broken but becomes less so in proceeding up the coast from Cross Sound. The mountain systems are confined chiefly to the Pacific coast line and extending along the Aleutian Islands finally dwindle away. The Rocky Mountain system in Alaska is higher and more complex than in Canada, having no defined ranges. They parallel the coast range in South-Eastern Alaska and then continuing in a more northerly direction cross the international boundary 75 miles from the Arctic Ocean. In the central part, and south-westward into the Aleutian Range, which is largely composed of volcanic material, are more than a dozen living volcanoes with Mount Wrangell (17,500 feet) as one of the largest of these. Mt. McKinley, the loftiest mountain on the continent (20,300 ft.) on the west face rises abruptly out of a marshy country with magnificent inaccessible granite cliffs and large glaciers. Of the glaciers of Alaska there are two general types; those terminating in low land or terminal moraines, and those discharg-

ing into the sea or rivers. Of the former there are over one hundred that nearly reach the sea. The Malaspina glacier is one of these, which fronts the sea-coast for fully 50 miles behind a narrow fringe of glacial debris. The surface is a vast elevated plane 1,500 sq. miles in extent. Of those discharging ice, the Muir is by far the largest, being fed by 26 tributaries. The main trunk 30 to 40 miles long has a discharging face of almost 2 miles where it has been estimated 30,000,000 cubic feet of ice is liberated daily. Most of the Alaskan glaciers are receding but not all of them. The nature of the movements of glaciers is still under discussion. To try to understand how it is that these millions of tons of ice move, we must consider the body as more or less plastic, and also that ice under pressure will lower its freezing point, and thus ice moving along the bottom of a glacier or along the rock sides is under great pressure; this lowers the freezing point, and the pressure is momentarily released by the melting of the ice, which after turning the corner, as it were, immediately freezes again. It is said that in Alaska the ordinary rate of motion is 7 feet a day (24 hrs.). From my own experience the motion would appear much slower than this, however.

Behring Sea is covered with almost eternal fog. The range of climate is considerable, that of the interior being quite distinct from that of the coast and south-eastern Alaska. The mild, even climate of the coast formerly supposed caused by the Japanese current is now held to be due to the general eastward drift of the waters of the North Pacific in the direction of the prevalent winds. The moisture thus carried in, is condensed along the coastal range, giving rise to the heavy rainfall of 80 to 110 inches and a mean annual temperature of 54 to 60 degrees F. In the interior the summers are much the same in character, the winters much more severe, with a range of extreme temperature of 75 to 90 degrees F. The Alaska summer is the uncertain season; at times the nights are cold even in July; snow falls, and there is frost in mid-August; sometimes rains are heavy, or again there is a veritable drought. Timber is fairly abundant, falling into two main divisions: the commercial though undeveloped forests of the south-east coast, which are found along the streams and on the lower slopes of the mountains and consist chiefly of western hemlock, Sitka spruce, yellow cedar and giant Cupressi; and the vast interior forests consisting chiefly of white and black spruce. Along the whole course of the Yukon River and along every river in central Alaska, these interior forests are almost entirely spruce, and which in the Yukon Flats grows in a vast impenetrable forest. The branches of the spruce do not spread even where there is room; the roots which

cannot penetrate the shaded and frozen soil spread over the ice underneath the tundra carpeting and often only by their matted network prevent the fall of the trees.

The industries up to a few years age were chiefly fish and fur, —the take in fish since 1879 has been practically constant. The take in halibut is increasing steadily, while the salmon industry, which dates from 1878, is more than half the total salmon product of the United States and is more than ten times the product of all other fish. On the Karluk river, Kadiak Island, is the greatest salmon fishery in the world, where more than 3,000,000 salmon have been canned in one season. In general the whole fur industry is discouragingly decadent. The sea-otter, which is the most valuable of all Alaskan furs, is now almost extinct. On some of the islands fox and marten are being bred for their pelts but nothing so far has come of this new industry. The skins of the black and silver fox are extremely rare. The whale fisheries have also greatly fallen off,—there is no profit on the oil and they are sought for the whalebone alone. The region now known as Alaska was first explored by Russian officers, Capt. Vitus Bering and Cherikof, in 1741. This first Russian voyage of discovery was carried out with much courage and daring which entailed much suffering, many of the crew dying from scurvy. Not long after their departure from Kamchatka on the Siberian coast the two vessels composing the expedition were separated, Bering in the "St. Peter" making his first discoveries of the mainland of Alaska—afterwards identified as being in the neighborhod of Yakutat Bay and the Mt. St. Elias region; he returned by way of the Aleutian Islands. The crew were shipwrecked off the Siberian coast, where Bering died. Cherikof made a much longer voyage, landing somewhere in the neighborhood of Prince of Wales Island, previous to the date Bering records for his discovery by one day. Cherikof's expedition lost part of the crew in two boats on landing to make their first explorations; from the ship they were seen to go ashore, and remained so long that Sherikof on board the ship became anxious; later natives appeared on the scene. Cherikof, very loath to leave his men behind, hovered about for a number of days and then finally withdrew and returned safely to Kamchatka. Nothing ever was heard of these lost members of the crew of the "St. Paul" (Cherikof's ship). It is interesting to note that in 1774 a Spanish expedition sailed up the Pacific coast from Mexico and in Latitude 55° sighted the most southern point of Prince of Wales Island and the north point of the Queen Charlotte Islands. In the hands of the natives they saw an old bayonet and pieces of old iron implements. It appears highly probably that Cherikof's mishap of 33 years previous

occurred in this vicinity; and in that case the present boundary of Alaska would be very nearly identical with the northern limit of the territorial claims of Spain, as based upon the rights of discovery. Kadiak Island was discovered in 1763 and a settlement effected in 1784.

Captain James Cook in 1778 made the first surveys from which the first approximately accurate chart of the coast was published, but it was reserved for Vancouver in 1793-4 to make the charts of the intricate coast line which have only in recent years been superseded. Vancouver's instruction from the British Admiralty were to search for an inter-oceanic passage south of latitude 60°, but as the explorations and the intercourses of the Russians with the natives had long since made them regard the passage as a myth, the expedition was by them invested merely with political aims. On account of the abuses perpetrated by private companies, amongst the Indians of the coast, a charter in 1799 was granted to a semi-official company called the "Russian American Co." whose duty it was, besides their trading operations, to preserve the peace of the country. A monoply of the American trade was previously granted in 1788 to another company, headed by Shelikof. It is interesting to note here the discovery of the Pribylof Islands, the home of the fur-bearing seal. The islands of this group were first visited by Pribylof in 1786 and previous to this time it appears as if natives even, had not visited them, as the account of the discovery goes on to say, that the shores were literally swarming with sea-otter (now almost extinct) and before leaving they had taken 40,000 fur seal, 2,000 sea-otter and 7 tons of walrus ivory. For 6 years Alaska was governed by these companies holding the monopoly of the country. Sitka was founded in 1793, and totally wiped out with its inhabitants by the natives in 1802. The headquarters of the Russian-American Co. were at Kadiak Island until 1805, thereafter at Sitka. In 1821 Russia tried to exclude navigators from Bering Sea and the Pacific Coast adjacent to her possessions, which led to the immediate protest of Great Britain and the United States. This protest from two quarters brought about in 1824 a treaty with the U. S. and one with Great Britain a year later in 1825, by which the excessive demands of Russia were relinquished, and the boundaries of the Russian possessions were fixed by description. The third article of the Russian-British treaty was that defining the boundary, and which was subsequently inserted in the Russian-American treaty at the cession of Alaska in 1867, and is thus worded: "The Boundary Line between the Possessions of the High Contracting Powers on the Coast of the Mainland and the Island of North Western America is established as follows: Be-

ginning at the Southermost point of the Island called Prince of Wales Island, which point lies in the parallel of 54 degrees, 40 minutes north latitude and between the 131st and 133rd degree of West Longitude, (Meridian of Greenwich). The said line shall extend to the north along the channel called Portland Channel, as far as the point of the continent when it strikes the 56th degree of North Latitude; from this last mentioned point the line of demarcation shall follow the summit of the mountains situated parallel to the coast as far as the point of intersection of the 141st degree of West Longitude (of the same meridian), and finally from the said point of intersection the said meridian line of the 141st degree in its prolongation as far as the Frozen Ocean." The fourth article stipulates that, with regard to the boundary lines established in the preceding article, it is understood that the island named Prince of Wales belongs entirely to Russia, and that whenever the sumit of the mountains which extend in a direction parallel with the coast from 56 degrees of north latitude to the point of intersection with the 141st Meridian shall prove to be more than ten marine leagues from the ocean, the boundary line of the British possessions shall run parallel with the winding of the coast at a distance not greater than ten leagues, the land between such line and the coast to belong to Russia. Article five provides that the contracting powers must not establish settlements within each others' territory. Article six stipulates that the subjects of Great Britain shall be forever at liberty to pass to and from the ocean by way of rivers and streams emptying into the Pacific Ocean and cutting through the coast strip, in Russian possession described above.

The last charter of the Russian-American Co. expired on the 31st of Dec. 1861 and Prince Maksutof, an Imperial governor, was appointed to administer the affairs of the territory. In Mr. ex-Secretary Foster's "Century of American Diplomacy" it is stated "Russia indicated a willingness (1845-1849) to give us its American possessions if we would adhere to the claims of 54° 40′ and exclude Great Britain from that portion of the ocean on the American continent. Russians fully impressed with the difficulty she would have in maintaining this distant colony and realized the expense of military and naval protection, which she could ill afford at that time. The Imperial Russian rule of Alaska lasted but six years.' In 1854, overtures by the United States for the purchase of Russian America were made during the presidency of James Buchanan, and on March 30th, 1867 the purchase was consummated for the sum of $7,200,000 (about 2 cents per acre) and on Oct. 18th of the same year the formal transfer of the territory was made at Sitka. The reasons for the purchase of Alaska by the

United States are set forth in a report of the United States Committee on Foreign Affairs as being "the laudable desire of citizens of the Pacific coast to share in the prolific fisheries of the oceans, seas, bays, and rivers of the Western world; the refusal of Russia to renew the charter of the Russian America Fur Company in 1861; the friendship of Russia for the United States; the necessity of preventing the transfer, by any possible chance, of the north west coast of America to an unfriendly power; the creation of new industrial interests on the Pacific necessary to the supremacy of our empire on the sea and land; and finally, to facilitate, and secure the advantages of an unlimited American commerce with the friendly powers of Japan and China."

During the six years of Russian rule there is one point worthy of note, namely, when a Russo-American company was formed to carry a telegraph line across Bering Straights from the Amur river in Siberia, and to project it on through Alaska and British Columbia. For three years work was carried on on this project, when the success of the Atlantic cable on the 27th August, 1866, rendered the construction of the line unnecessary. In the history of Alaska the two events of greatest general interest have been the fur seal arbitration of 1893 and the Canada-Alaska boundary dispute, the latter settled by an international tribunal of British and American jurists in London in 1903. The boundary dispute involved the interpretation of the treaty of 1825, which was in part reiterated in the terms of the transfer of Alaska from Russia to the United States in 1867 already referred to. The points of contention were the location of the Portland Canal and the question whether the boundary line should cross, or pass around the heads of the fjords or inlets of the coast.

The tribunal was not a court of arbitration, since its function was not to decide the boundary but to settle the meaning of the Anglo-Russian Treaty, which provided for an ideal and not a physical boundary; this boundary did not fit in with geographical facts, hence the judgment was based upon the motive of the treaty and not upon the literal interpretation of such elastic terms as ocean, shore and coast. The decision of the tribunal in the main sustained the claims of the United States. For 36 years, between 1867 at the cession of Alaska, to 1903 when the boundary was finally settled, no attempt was made to lay down any permanent boundary. From 1872 urgent and almost yearly requests were made by the British and Canadian Governments to the Government of the United States for an "expedient settlement."

During this period however, provisional boundaries were established under the Modus Vivendi of 1898, at the summits of the Chilcoot and White Passes and on the Chilcat and Klehni rivers (just above the Indian village of Klukwan on the former) in 1900. Another provisional boundary was marked on the Stikine river as far back as 1877, arising directly out of what is known as the Peter Martin Case—a prisoner who had escaped and had been retaken, out of which complications arouse as to what territory he was in when retaken. This old provisional boundary was situated at the big bend in the Stikine and was there established by Jas. Hunter C. E. of Vancouver.

In 1866 the United States revived the old Russian demands of 1821, claiming maritime sovereignty over a hundred miles of ocean in Bering sea, which led to the confiscation or driving away of 20 British ships, but this score was settled by the Bering Sea Arbitration of 1893 deciding it to be in violation of the laws of nations. By the Treaty of Convention of 1892 Great Britain and the United States showed an equal desire to provide for the removal of all possible cause of difference between their respective governments in regard to the delimitation of the boundary line, in respect to such portions as may not in fact have been permanently fixed by the treaties heretofore concluded. The treaty also provides for a co-incident or joint survey of the territory adjacent to that part of the boundary line from the latitude 54° 40′ north (Prince of Wales Island) to the point where the boundary line meets the 141st Meridian, also that a commission be appointed by the high contracting parties with a view to ascertaining the facts and data necessary to the permanent delimitation of the boundary in accordance with the spirit and intent of the existing treaties in regard to it, between Great Britain and Russia and between the United States and Russia. The high contracting parties agreed that as soon as possible after the report or reports of the Commissions shall have been received they will proceed to consider, and establish the boundary line in question. By a subsequent convention the above was extended to the 31st of Dec. 1895; on that date the joint reports to the respective governments were submitted. Although the treaty also provided for the consideration of the boundary question as soon as the report of the Commission had been received, the matter was not taken up till three years later, in 1898, when it was discussed by the Joint High Commission, but without any action being taken. During this interim of three years, another convention 1897 was signed for the appointment of a commission to mark the survey of the 141st degree of west longitude, with the conditional right to deflect slightly in case the summit of Mt. St. Elias did not lie on the said 141st Meridian.

We now come back to the Tribunal of 1903 already mentioned, when the Alaska Boundary was for all time settled by the answering of five questions put to the tribunal. In the main, as stated before, the tribunal sustained the claims of the United States, which hinged chiefly on the answering of the fifth question in the affirmative, that is, that there should remain in the exclusive possession of the United States a continuous fringe, or strip of coast on the mainland not exceding 10 marine leagues in width; separating the British possessions from the bays, ports, inlets, havens, and waters of the ocean. The line was drawn from Cape Muzon, on Prince of Wales Island, in a straight line to a certain point off the mouth of the Portland Canal; up the canal to a certain point, then following certain mountain summits (which they marked out on the map prepared by the survey made under the treaty of 1892) to Mt. St. Elias, which is near the 141st Meridian, and thence by this meridian to the Arctic Ocean. The method of survey adopted was to expand from points on the coast and islands adjacent thereto, whose geodetic positions were already determined by the U. S. Coast and Geodetic Survey; a system of triangulation inland to the boundary line with the object primarily of determining the location of every boundary peak, and secondly to furnish points of control and a basis on which to extend the photo-topographical work already completed along the coast adjacent to the boundary along its entire length. Advantage was taken of the many rivers and inlets as means of transportation, up which the triangulation naturally follows. These several expansions, being connected at the line, give practically an unbroken stretch of triangulation along the boundary.

141st Meridian.

We now come to a consideration of the 141st Meridian. This portion of the boundary has never been under dispute nor could it well be. It is over 600 miles long and is crossed midway by the Yukon River. Since the time of the earliest treaties its southern extremity was known to be near Mt. St. Elias; and on the Arctic Ocean, navigators, many of whom wintered on Herschel Island, must have known the approximate position of its northern end. The frequent petitions of the miners on the Forty Mile River (35 miles below Dawson) to the government, previous to the discovery of coarse gold on that river in 1886, for some indication of the position of the boundary, seems to have been the cause of the first action being taken in determining even approximately where the line lay in the interior. Consequently in 1887 Mr. Wm. Ogilvie carried

a survey from Pyramid Harbor over the Dyae pass to Lake Lindeman, thence to Lake Bennet down the Yukon to 3 miles east of where the boundary line crosses that river. Here an observatory and winter quarters were established, and preparations made for a determination of longitude. Observations for longitude by occultations of stars by the moon had been arranged for, of which about six were to occur at this station, during the lunations of Oct., Nov. and Dec., but failed through continued bad weather. The longitude of the station was however successfully determined by culminations of the moon observed in conjunction with ten stars, five culminating on either side of that of the moon. Observations on 22 nights resulted in the same number of separate determinations for longitude from the observed sidereal time of lunar passage across the meridian. The mean of these separate determinations was taken to be the longitude of the station (140° 54′ 11.8″). Observations for latitude were also taken (at a point 60 feet north of the transit station) by the method of transit of stars over the Prime vertical, and also later a sea elevation of the station deduced from barometer readings, compared with those taken on the same days at Victoria, Sitka and Port Simpson. With the determined longitude of the station, the 141st Meridian was established by a connecting traverse run down the ice of the Yukon, which showed it to be 2.869 miles below. In a similar manner the boundary was also marked where it crossed the Forty Mile River, by a traverse connecting it to the Yukon traverse, which showed it to be 23 miles up from the mouth of the Forty Mile River. Mr. J. E. McGrath of the U. S. C. & G. Survey in 1898-90 made a separate determination for longitude from the same observatory. He showed the boundary to be 2.707 miles west or 855 east of Mr. Ogilvy's position. In 1895 Mr. Ogilvy returned to his old observation of 1887 and 8, and added 6 more observations for longitude by moon culminations. These 6 combined with the already 22 gave very little change in his former position after again running down a traverse from the observation station to the boundary. From the direction of the last course of the traverse a north and south line turned off (weather conditions preventing an independent observation for azimuth) and the line cleared 8 miles north of the Yukon and projected south 55 miles, passing the point established on the Forty Mile River (8 years previous) within 200 feet.

The end of the finished line was 5 miles north of where the Sixty Mile River crosses the boundary. Seven years later (1902) Mr. McArthur carried a survey up the Sixty Mile River from its confluence with the Yukon to the boundary, and picking up the line where it had been left off extended it on further south to a point 122 miles from the Yukon.

Another point was determined on the boundary by Mr. Turner of the U. S. Coast and Geodetic Survey in 1889-90 on the Porcupine River, which lay 150 miles due north of where the boundary crossed the Yukon. After completing this work Mr. Turner made a survey from the boundary down the Porcupine to Ft. Yukon at its mouth. Having missed the last steamer leaving St. Michaels for Seattle, he was forced to spend his second winter in the country. From the hardships of his work in the north Mr. Turner died, leaving much of his valuable work in an unfinished state. Before leaving this 122 miles of provisional boundary run south of the Yukon and the other separate determination of a point on it, it is interesting to note how closely this early work compared with the final boundary as subsequently laid down. Mr. Ogilvy's determination on the Yukon was found to lie but 369.6 ft. to the west of the final line. Some idea of the closeness of this determination may be had when it is known that any error in the sidereal time of observation of the meridian passage of the moon affects the resulting longitude by 27 times that amount. Thus an error of 0.01 part of a second in culmination time, would produce an error in longitude of 176 feet at this altitude (64° 41'). Mr. Turner's point on the Porcupine was 1,000 feet to the west. In the projection of the line to the south of the Yukon, besides the divergence of the two meridians there has been a large persistent swing to the west. This same swing also occurred on the final determination of the line, that is, points established as being on line showed by triangulation the line to be slightly to the westward. The westward trend here however, was of a smaller order. The former was due most likely, to an error in azimuth, while the latter, was due probably to station error. At the Yukon the provisional boundary was west 369.6 feet. At monument No. 27, 80¾ miles south of the Yukon the provisional boundary was west 822 feet. At monument No. 44, 121¾ miles south of the Yukon the provisional boundary was west 846.2 feet.

As to the final determination of the meridian, the convention of Mar. 25, 1905, between Great Britain and the United States for the survey of the 141st Meridian provided for the appointment of a fourth commission whose duties were to determine the meridian in question where it crossed the Yukon River and to survey and mark the line north and south from that point. In pursuance with this convention the commission, consisting of Dr. W. F. King, His Majesty's Commissioner, and Mr. O. H. Titmann, Commissioner on behalf of the United States, as the first step to determine the boundary on the Yukon, decided that the determination of this meridian should be made from the determined longitude positions of Van-

couver and Eagle (Fort Egbert), which is just 12 miles below the boundary.

The longitude of Vancouver was determined from Ottawa in 1900, that of Ottawa determined from Montreal in 1896, and that of Montreal had been determined by connection with Greenwich and with certain points in the United States. By a combination of these latter observations a presumably accurate longitude of Montreal had been obtained. The longitude of Seattle had been established through the United States longitude net. Such a series depends for the accuracy of any longitude upon the accuracy of all steps behind it. These errors are very small individually but are subject to accumulation. For this reason it is not advisable to depend for longitude upon a mere chain but cross connections are needed by which a longitude may be determined from as many independent points of known longitude as possible. To strengthen the position of Vancouver, therefore, difference of longitude determinations were carried out in 1905 between Vancouver and Seattle. Getting back to the boundary: The telegraph line from Dawson to Eagle follows the Yukon River and crosses the boundary. From Dawson communication with the south is had by Government line to Ashcroft, B. C., and thence by the C. P. R. telegraph to Vancouver. Eagle is connected with a telegraph line, built by the United States Government, with Valdez, Alaska, from which communication is had with Seattle by cable. The longitude of Eagle was determined by the United States in 1905. A double determination of longitude at the meridian from both sides was therefore possible and was decided upon by the Commissioners as already mentioned. An interesting point in connection with the transmission of signals between the boundary and Vancouver was, the existence of four repeaters on this line, from the construction of which, there is no certainty that the time of transmission of signals in opposite directions through them would be equal, and any difference in their time would affect their resulting longitude by half of its amount.

A repeater is a combination of relays whereby signals are automatically transmitted from one section of the line to another for the purpose of better utilizing power from the batteries. To eliminate this uncertainty, directions were given to the repeating stations to reverse their repeaters, between the exchanges, thereby if done without change of adjustment, should approximately at least, eliminate the error from the mean of the two exchanges. A calculation by Dr. Klotz showed that the difference of time of transmission was of the order of about 0.022 seconds. The effect of such a difference (that is one-half this amount) on the longitude would

amount to 7 feet at the Yukon. During the latter part of the season of 1906 observers were stationed on the boundary, Eagle and Vancouver, and in the exchange of signals and the observations of transits of stars for clock corrections, the position of the 141st Meridian was finally established. An accurate determination for latitude was also observed. In the early part of the next year (1907) field work in earnest commenced. The observing pier being slightly off the meridian, an offset 17.62 ft. east was made and a gun barrel there sunk, marking thus the first point on the boundary. An observation for azimuth was then taken and a true north and south line laid down between two points on the meridian 1¼ miles apart. This line produced north to the Arctic and south to Mt. St. Elias by agreement, constituted the International boundary line. The method of survey of this line divides itself up into a number of heads. First may be mentioned the method of prolonging the initial azimuth; this is accomplished by the most accurate means known, by the use of helioscopes, which make it possible to see clearly the position of a station situated at a long distance by a deflected ray of sunlight; and a transit fitted with a micrometer eye piece, for measuring small angles to a high degree of accuracy. The observer being stationed at one end of the line to be produced, with a helioscope stationed at the other, and seen by the observer as a clear spot of light, proceeds to set at a distance ahead, (preferably an equal distance to that of the line to be prolonged) two other points situated a short distance on either side of the line. This is accomplished by the observer, shifting the man ahead by signals, until he is brought approximately on line. The two points are then found and permanently marked, by measuring an arbitrary distance (not greater than about 6 feet), first to the left and then to the right, of this approximate position of the line. Over one and then the other of these points, the helioscope is then set, and directed towards the observer, who may be as far as 30 miles away. The observer then proceeds to measure, by a series of readings, the small angles subtended at his station, by the distance these two points are off the line. From a knowledge of the distance between the two arbitrary points, and the angle between each of them and the line subtended at the observing station, a point on line between the two arbitrary points is obtained (by dividing the distance between the two arbitrary points into a proportion equal to that of the observed angles. The observing party and head of rear helioscope are in communication with one another by the aid of the Morse Code of signals. After the line projection secondly a triangulation scheme is thrown out along the line in a series of quadrilaterals (with a few interior point figures where the lines of sights along the diagonals are obstructed)

for the purpose of establishing the geodetic positions of the points fixed on the line; to carry across the country a line of trigonometrical levels; and to act as a control to the topographical survey. Thirdly. A topographical map is being made of a strip of country lying two miles on either side of the line, by plane table, using 100 foot contour interval. Parts of this country have also been covered by photo topography. Fourthly. A stadia is run along the line and a vista cleared, where the timber exists, giving a 20 foot cedar clear sky line. The distances and elevation along the line by stadia are adjusted between known points and are used in the adjustment of the plane table sheets and in the plotting of a profile of the line. The triangulation has been run between three measured bases south of the Yukon and two so far north of it. The position of the boundary is being permanently marked, by intervisible monuments for the most part. The average distance apart is three miles with a maximum of over 6 miles where difficulty is encountered in finding suitable ground, the monuments, out of necessity, are spread further apart. They mark all the prominent ridges. A large monument in the form of an obelisk, 5 feet high, and weighing 300 lbs., is used to mark all the important river crossings and points. The others are all of the same type, standing 3 feet high, and weighing 55 lbs. Both types are set in a concrete pier, made level with the ground and containing a cubic yard of material. Over the strip of boundary, completed south of the Yukon for 212 miles, there are planted 76 monuments. There still remains of this southern section 80 miles untouched at its south end. It is that portion of the boundary which crosses over the Mt. St. Elias Alps, or portion of the coast range of mountains from Mt. St. Elias to the Natazhat ridge, the inland fringe of this section. It is not possible, from what is at present known, to mark the line here in any way, as the whole territory appears covered with glaciers and mountain ranges towering 8,000 feet high, on top of which the snow and ice caps never melt. No rock is exposed where a permanent mark could be left. After completing three seasons' work on this southern end, work was commenced from the Yukon north towards the Arctic. This is the section now being completed near the Arctic Ocean. The characteristics of the country have been very diverse. Muskeg flats 20 miles across have been passed through, fringed by high jagged ridges, and then more frequently the rolling wooded country is met. The drainage of the country has lent itself very favorably for means of transportation, the Yukon, White and Porcupine rivers being the main arteries which have made it possible to land supplies right on the line in a number of places. The means of transport across country is chiefly by pack train. The horses have been wintered successfuly in the

country through three winters, at Champaign Landing and on the bars of the upper part of the White River. Five hundred miles of precision levels have been run by Mr. Nelles and Mr. Leland of the U. S. Coast and Geodetic Survey, during 1908, 1909 and 1910, bringing in a mean sea level to the boundary line, from tide water at the head of the Lynn Canal. The assumed datum taken at the start of the survey was found to be in error (low), by mean sea elevation thus brought in, by only 38.4 feet. Since the beginning of the survey in 1907 work has been carried on steadily each season, and at the end of this season it is fully expected that all will be completed, making a total length of finished boundary of 543.5 miles, over which length there will be set about 180 monuments. Within a year or so the whole of the Canada-Alaska boundary survey will be a matter of history.

MEMBERS

1912

The names of those members granted exemption by By-laws ratified by the Association are marked *.

NAME AND P.O. ADDRESS. — DATE OF ADMISSION BY BOARD.

Abrey, George Spencer,
606 Indian Rd., Toronto .....6th April, 1906

Allan, John Richard, Renfrew.....6th Nov., 1894
Grad. S.P.S.

Allison, Calvin Bruce, South Woodslee 22nd Feb., 1911
D.L.S. Grad. S.P.S.

Anderson, Frederick John, Niagara Falls,
1st May, 1910

Anderson, Herbert McEwen, North Bay, 18th April, 1910

Anderson, Ralph Mackenzie, Toronto,
16 St. Vincent St. .....2nd May, 1911
Grad. S.P.S.

Angus, George Page, North Bay.....18th April, 1911

Ardagh, Arthur Gowan, Barrie.....18th Feb., 1908
Grad. S.P.S.

Attwood, Charles Hartley, Hamilton,
88 King Street W..... 22nd Feb., 1911

Aylesworth, John Sidney, Sharp's Corners, Ont. 9th Jan., 1871
D.L.S.

Aylsworth, Charles Fraser, Jr., Madoc.....8th Jan., 1886
D.L.S.

Baird, Alexander, Leamington .....7th July, 1877
C.E.

Baird, William Johnston, Scarborough.....22nd Feb., 1912

Baker, Mason Herman, St. Thomas ... 16th Feb., 1909
D.L.S.

Barrow, Ernest George, Hamilton.....4th Oct., 1877
D.L.S., Mem. Can. Soc. C.E., City Engineer.

Bazett, Edward, Huntsville.....8th July, 1881
D.L.S.

Beatty, David, Parry Sound.....12th July, 1869
D.L.S.

NAME AND P.O. ADDRESS. DATE OF ADMISSION BY BOARD.

Beatty, Herbert John, Eganville.....8th Nov., 1893
Grad. S.P.S.

Bell, Andrew, Almonte..... 14th Oct., 1866
B.A., Mem. Am. Soc. C.E., Mem. Can. Soc. C.E., Mem. Ont. A.A., D.L.S.C.E.

Bell, James Anthony, St. Thomas.....11th Oct., 1875
D.L.S., Co. Engineer, Elgin; City Engineer, St. Thomas.

Bigger, Charles Albert, Ottawa, 145 Gloucester St. .....6th Jan., 1882
D.L.S., A.M. Can. Soc. C.E., B.C.S., Astronomer, Dept. Interior.

Bingham, Edwin Ralph, Fort William...17th Feb., 1906
D.L.S.

Blake, Frank Lever, Toronto, Meteorological Office .....13th April, 1875
D.L.S.

Blair, William John, New Liskeard.....13th Feb., 1904
Grad. S.P.S.

Blandy, Oliver Roland, Hamilton.....22nd Feb., 1912

Bolton, Ellsworth Doan, Listowel.....7th Nov., 1899
B.A.Sc. (McGill).

Booth, Charles Edward Stewart, Not known .....6th April, 1882
D.L.S.

Boswell, Elias John, C.P.R., Montreal 7th Nov., 1896
Grad. S.P.S., D.L.S.

Bowman, Clemens Dersteine, West Montrose.10th July, 1879

Bowman, Herbert Joseph, Berlin.....7th Jan., 1887
D.L.S., Grad. S.P.S., Treasurer County Waterloo, Assoc. Mem. Can. Soc. C. E.

Bowman, Edgar Peterson, West Montrose..17th April, 1907

Bray, Harry Freeman, Oakville.....10th July, 1882
D.L.S.

Bray, Lennox Thompson, Vegreville, Alta. 17th Feb., 1902
D.L.S.

Bray, Samuel, Ottawa, Dept. of Indian Affairs.....6th Jan., 1877
D.L.S., C.E.

Brian, Michael Edward, Windsor City Hall .....17th Feb., 1906
B. A. Sc.

Brown, David Benjamin, Box 304, Manads, Brazil, South America ..... 23rd Feb., 1904
D.L.S.

NAME AND P.O. ADDRESS. DATE OF ADMISSION BY BOARD.

Brown, George Laing, Morrisburg.....19th Feb., 1898
Grad. S.P.S.

Brown, John Alexander, Sarnia,
233 South Brock St. ..... 22nd Feb., 1911
Grad. S.P.S.

Brown, John Smith (address not known)... .8th July, 1852
D.L.S.

*Browne, Harry John, Toronto, 203 Albany Ave. ..... 6th July, 1872
C.E.

Browne, William Albert, Toronto,
18 Toronto st. .....10th April, 1876

Browne, Wm. Herbert, Toronto,
18 Toronto St. ..... 18th April, 1910

Burd, James Henry, Sudbury. ..... 2nd Oct., 1905
Grad. S.P.S.

Burgess, Edward LeRoy, Ottawa, 21 First Ave..6th May, 1905

Burt, Frederick Percy, New York, N.Y. .....8th July, 1885
President "The American Architect," Times Bldg., New York.

Burwash, Nathaniel Alfred,
113 Bloor St. W., Toronto ..... 6th May, 1905
D.L.S., Grad. S.P.S.

Bush, Clayton, Elgin, Edmonton, Alta.....15th May, 1908
Grad. S.P.S.

Butler, Matthew Joseph, President
Iron and Steel Co., Sidney, N.S. 11th Jan., 1878
C.E., M.I.C.E., Mem. Am. Soc. C.E., Mem. Can. Soc. C.E.

Byrne, Thos. Henry, Ottawa. ... 24th February, 1910

Caddy, John St. Vincent, Ottawa,
327 Laurier Ave.....6th Oct., 1866
D.L.S.

Campbell, Alexander Stuart,
288 Queen St., Kingston. ..... 24th February, 1910

Campbell, Archibald William, Ottawa,
Deputy Minister of Railways & Canals .10th April, 1885
C. E.

Carre, Henry, 276 Albert st., Belleville,
Box 203 .....8th Nov., 1861
M.O. & Georgian Bay Canal, B.A. and C.E. (Trin. Coll., Dublin), D.L.S

*Carroll, Cyrus, (not known) ..... 10th Jan., 1860
Mem. Can. Soc. C.E., D.L.S. District Surveyor and Engineer.

NAME AND P.O. ADDRESS. DATE OF ADMISSION BY BOARD.

Casgrain, Joseph Phillippe Baby,
180 St. James St., Montreal. 5th Jan., 1887
D. L. S., P. L. S., (Que.) C. E, Assoc. Mem. Can. Soc. C. E. Chief Eng. M. & P. J. Ry., Senator.

Cavana, Allan George, Orillia.....8th July, 1876
D.L.S.

Chase, Albert Victor,
Orillia, Box, 762 ..... 21st April, 1909
Grad. S.P.S.

Chipman, Willis, Toronto, 103 Bay st. .....4th Oct., 1881
D.L.S., B.A.Sc. (McGill), Mem. Am. Soc. C.E., Mem. Can. Soc. C.E.

Christie, Uriah Wesley,
815 Somerset St., Ottawa. ..... 1st March, 1906

Clarke, Fred Fieldhouse, 22 Gibson Ave.,
Toronto, Ont. ..... 31st March, 1905
Grad. S.P.S.

Clarke, Leonard Oswald, North Bay .....14th Feb., 1903

Code, Abraham Silas, Alvinston.....14th April, 1896

Code, Samuel Barber, Smith's Falls.....1st May, 1905

Code, Thomas George,
Box 330, Cobalt ..... 17th April, 1907

Code, Robert Wilmot, Alvinston .....April, 1911

Code, Richard Stanley,
Box 330, Cobalt ..... 17th April, 1907

Coltham, George William, Aurora.....1st May, 1912

Coltham, Jas. T., Aurora, Ont.....18th April, 1911

Cook, William Albert McMichael,
66 Brunswick Ave., Toronto .....19th April, 1910

Cotton, Arthur Frederick,
New Westminster, B.C. ..... 11th July, 1874

Cozens, Joseph, Sault Ste. Marie.....7th July, 1875
D.L.S.

Crerar, Samuel Rutherford, Toronto,
School of Science.....1st March, 1906
D.L.S., B.A.Sc., Toronto.

Dalton, John Joseph, Weston, Ont.....11th Jan., 1878
D.T.S.

*Davidson, Alexander, Arkona.....11th Oct., 1858
D.L.S.

Davis, A.R., 146 Cottingham St., Toronto
B.A.Sc. (McGill).

NAME AND P.O. ADDRESS. DATE OF ADMISSION BY BOARD.

Davis, William Mahlon,
Prince Rupert, B.C. ..... 11th April, 1885
Grad. R.M. Coll. (Kingston), City Engineer.

Deacon, Thomas Russ, Winnipeg.....12th Nov., 1892
Grad. S.P.S.

Deans, William James, Brandon, Man....11th July, 1884
D.L.S.

DeMorest, Richard Watson, Sudbury.....9th April, 1889
M.E.

Dempster, Herbert Orville,
Gananoque. ..... 24th February, 1910

Dickson, James, Fenelon Falls.....6th April, 1867
D.L.S.

Dixon, Howard, Can. Nor. Ry., Winnipeg....14th Feb., 1903
Grad. S.P.S.

Dobie, James Samuel, Thessalon .....21st Feb., 1898
B.A.Sc. (Toronto Univ.), D.L.S.

Dunn, Thomas Hamilton, Winchester. .....14th May, 1906
Grad. S.P.S.

Eagleson, Francis Merwin,
Winchester, Ont. ..... 11th May, 1909
Grad. S.P.S.

Earle, Wallace Sinclair, Picton.....22nd Feb., 1912

Esten, Henry Lionel, Toronto, 157 Bay st....7th Jan., 1887

Evans, John Dunlop, Trenton.....8th July, 1864
D.L.S., Mem. Can. Soc. C.E., Chief Eng. Cent. Ont. Ry.

Fair, John, Brantford.....13th April, 1875

Fairbairn, Richard Purdom, Toronto,
452 Markham st. .....7th Oct., 1876
Surveyor for Dept. of Pub. Works, Ontario.

Fairchild, Charles Court, Brantford.....9th April, 1894
Grad. S.P.S., D.L.S.

Fairchild, William Howard, Brantford.....17th Feb., 1900

Farley, Sidney Edward, 362 Rideau St.,
Ottawa ..... 21st April, 1909
P.L.S., Que.

Farncomb, Alfred Ernest, Red Deer, Alberta.9th April, 1895
D.L.S.

Farncomb, Frederick William, London,
213 Dundas st. .....6th Nov., 1889

Fawcett, Thomas, 50 Emmett St.,
Ottawa ..... 6th Jan., 1881
Dom. Topographical Surveyor.

NAME AND P.O. ADDRESS. DATE OF ADMISSION BY BOARD.

Fitton, Charles Edward, Orillia, Box 142..10th April, 1879
D.L.S.

Fitzgerald, James William, Peterborough...13th Feb., 1904

Flater, Frederick William, Chatham.....9th April, 1888

Francis, John James, Sarnia P.O.,
Box 304 .....16th Oct., 1861
D.L.S.

Fuce, Edward Oliver, Galt. .....17th Feb., 1906

Fullerton, Charles Herbert, New Liskeard....7th May, 1906
D.L.S., Grad. S.P.S.

Galbraith, William, Bracebridge.....4th April, 1883
D.L.S.

Gardiner, Edward, St. Catharines.....6th Jan., 1866
D.L.S.

Gaviller, Maurice, Collingwood, Box 164....6th Jan., 1866
C.E. (McGill), D.L.S.

Gibson, H. H., Willowdale, Ont. ..... 8th Sept., 1891

Gibson, Morton Milne, Willowdale.....22nd Feb., 1912

Gibson, Peter Silas, Willowdale.....19th July, 1858
C.E.M.S. (Mich. Univ.), D.L.S., Mem. Can. Soc. C.E.

Gibson, Wilbert Silas, Willowdale.....21st Feb., 1898

Gillon, Douglas John, Fort Frances.....9th Nov., 1895
Grad. R.I.E. Coll.

Gourlay, Robert Murray, Toronto.....22nd Feb., 1912

Graydon, Aquila Ormsby, London.....8th July, 1880

Grant, Russell Reeve, Toronto,
106 Warren Rd. ..... 23rd March, 1911
Grad. S.P.S.

Green, Thomas Daniel, Prescott, Ont.....7th Jan., 1885
D.L.S.

Greenlees, Alex'r Hunter, 866 Wellington
St., N., London, Ont..... 21st April, 1909

Griffin, Albert Dyke, B.A., Galt.....11th Nov., 1890

Halford, Abraham Joseph Bartholomew.
25 Surrey Place, Toronto. .....10th April, 1885

NAME AND P.O. ADDRESS. DATE OF ADMISSION BY BOARD.

Hanes, George Samuel,
North Vancouver, B.C.....6th May, 1905
City Engineer. Grad. S.P.S.

Hart, Milner, Toronto, 51 Yonge St. 11th July, 1863
D.L.S.

Henry, Frederick, London, Albion Bldg....7th April, 1887

Hogarth, George, Toronto.....22nd Feb., 1912

Holcroft, Herbert Spencer, 182 Bloor St., W.
Toronto ..... 17th Feb., 1902
D.L.S., B.A.Sc. (Toronto Univ.).

Hopkins, Marshall Willard, Edmonton, Alta.13th Nov., 1893
D.L.S., B.A. Sc. (McGill), Assoc. Mem. Can. Soc. C.E.

Hutcheon, James, Guelph, 48 Glascow St....10th Nov., 1891
Grad. S.P.S.

Jackson, Alan Mair, Dunville.....15th April, 1912

Jackson, John Edwin, Temple Bldg.,
Brantford ..... 22nd Feb., 1911
Grad. S.P.S.

Jackson, John Herbert, Niagara Falls.....16th Feb., 1901

James, Darrell Denman, Toronto,
227 George st. .....3rd Nov., 1891
D.L.S. B.A., B.A.Sc. (Toronto Univ.).

James, Silas, 227 George St., Toronto. 19th July, 1858
D.L.S.

Johnston, Herbert, Berlin.....21st Feb., 1905
Grad. S.P.S.

Johnston, Wm. James, St. Catharines. 10th May, 1910

Jones, Charles Albert, Petrolea.....8th April, 1881
D.L.S.

Jones, George Samuel, (not known)..... 21st April, 1909
Grad. S.P.S.

Jones, John Henry, Sarnia, Box 194.....10th Oct., 1886
D.L.S.

Jones, Thomas Henry, Brantford.....10th Oct., 1878
B.A.Sc. (McGill), D.L.S., City Engineer.

Jupp, Albert Ernest, Toronto,
165 Bolton Ave. ..... 22nd Feb., 1911
Grad. S.P.S.

*Keefer, Thomas Coltrin, Rockliffe Manor
House, Ottawa .....14th Aug., 1840
D.L.S., C.E.

NAME AND P.O. ADDRESS. DATE OF ADMISSION BY BOARD.

Kirkpatrick, George Brownly, Toronto,
Dept. of Lands, Forests and Mines.....13th April, 1863
D.L.S., Director of Surveys.

Laird, James Stewart, Essex.....6th April, 1867
D.L.S.

Laird, Robert, Haileybury.....11th Nov., 1887
Grad. S.P.S.

Lane, Frederick Carleton, Sudbury.....22nd Feb., 1912

Lang, John Leiper, Sault Ste. Marie.....2nd May, 1908

Lawe, Henry, Ottawa. .....6th Oct., 1860

Lee, Roger Melville, Galt..... 19th April, 1910
D.L.S., S. .S.

Le May, Tracy Deavin, Toronto,
88 Huntley Street.....1st May, 1909
City Surveyor.

Lewis, John Bower, Ottawa, Brunswick
House .....4th Oct., 1883
D.L.S., P.L.S. (Quebec), C.E.

Lloyd, Norval Clarence, Toronto.....22nd Feb., 1912

Lougheed, Aaron, Port Arthur.....12th Nov., 1888
D.L.S.

Low, Edward Hamilton, Sudbury. .....17th Feb., 1902
Grad. R.M.C. (Kingston).

*Low, Nathaniel Edward, Sarnia.....11th July, 1856
D.L.S.

Lumsden, Hugh David, St. Andrews, N.B. 4th Jan., 1866
C.E., D.L.S., M.I.C.E., Mem. Can. Soc. C.E.

MacKay, James John, Hamilton
7 Hughson St. .....25th Feb., 1899

MacKenzie, William, Sarnia.....11th April, 1896
Grad. R.M.C. (Kingston).

MacKenzie, William Lyon,
Can. Nor. Ry., Winnipeg. ..... 7th April, 1887
C.E.

McAuslan, Herbert James, North Bay.....19th Feb., 1906
D.L.S., B.A.Sc. (Toronto).

McCaw, Robert Daniel, Sidney,
Vancouver Island, B.C. ..... 16th Feb., 1907
D.L.S.

McColl, Charles Ross, Walkerville,.....4th May, 1909
Grad. S.P.S

NAME AND P.O. ADDRESS. DATE OF ADMISSION BY BOARD.

McCubbin, George Albert, St. Thomas,
City Engineer's Office .....9th Nov., 1895
Assistant City Engineer.

McDowall, Robert, Owen Sound.....11th Nov., 1890
Grad. S.P.S., Town Engineer.

McEvoy, Henry Robinson, St. Mary's.....10th July, 1875
D.L.S.

McFadden, Moses (not known). ..... 13th April, 1858
D.L.S., P.L.S. (Man.).

McFarlen, George Walter, Toronto, City Hall,
City Engineer's Office.....11th Nov. 1858
Grad. S.P.S.

McGeorge, William Graham, Chatham,
161 Queen St. ..... 22nd Feb., 1911
Grad. S.P.S. D.L.S.

McGregor, James Martin, Chatham.....22nd Feb., 1912

McKay, Owen, Walkerville, Ont., Box 324.....7th Jan., 1887
M.C.S.C.E., Grad. S.P.S.

McLean, James Keachie, Ottawa, Dept.
Indian Affairs.....8th April, 1876
D.L.S.

McLean, William Arthur, Toronto,
Parliament Buildings.....21st Feb., 1898
A. M. Can. Soc. C. E., Engineer of Highways.

McLennan, Murdoch John, Williamstown...13th Nov., 1893
B.A.Sc. (McGill), D.L.S.

McMeekin, Albert, Kenora ....22nd Feb., 1911
B.A.Sc. (McGill) D.L.S.

McMullen, William Ernest, Frederickton, N.B.
Dept. Crown Lands .....11th Nov., 1892

McNab, John Duncan (not known).....9th Oct., 1879

McNaughton, Alexander Lorne, Cornwall.....May, 1905

McNaughton, Finlay Donald, Cornwall.....25th Feb., 1899

McPherson, Charles Wilfrid, Dawson, N.W.T.
Director of Surveys, Yukon.....21st Feb., 1899
D.L.S.

McPhillips, George, Winnipeg, Man.....9th July, 1885
D.L.S., P.L.S. (Man.).

Malcolm, William Lindsay, Kingston...22nd Feb., 1912

NAME AND P.O. ADDRESS. DATE OF ADMISSION BY BOARD.

Manigault, William Mazyck, Strathroy, P.O. Box 300 ..... 8th July, 1876

Miller, Frederick Fraser, Napanee..... 8th Jan., 1885
D.L.S.

Montgomery, Royal Harp, Prince Albert, Sask. 6th May, 1905
D.L.S.

Moore, John MacKenzie, London, Albion Building ..... 9th Oct., 1879

Moore, John Harrison, Smith's Falls..... 11th Nov., 1889
Grad. S.P.S.

Moore, William James, Pembroke ..... 18th Feb., 1908

Morris, James Lewis, Pembroke..... 7th July, 1886
D.L.S., C.E. (Toronto Univ.).

Murdoch, William, Bowmanville ..... 10th Jan., 1860
D.L.S., C.E.

Murphy, Charles Joseph, Toronto, 157 Bay st. ..... 6th Oct., 1886

Nash, Thomas Webb, Kingston..... 7th April, 1854
D.L.S.

Neelands, Ernest Wesley, New Liskeard, Ont. ..... 16th Feb., 1909
Grad. S.P.S.

Newman, John James, Windsor..... 21st Feb., 1898

Newman, William, Windsor, 57 Sandwich st. w. ..... 12th Nov., 1892
Grad. S.P.S.

Ogilvie, William, 615 North 18th St., Paris, Texas. ..... 12th July, 1869
D.L.S.

O'Hara, Walter Francis, 236 Waverly St., Ottawa..... 14th April, 1892
D.L.S.

Ord, Lewis Redman, Hamilton, c.o. Traders Bank ..... 8th January, 1885
D.L.S.

Parsons, Johnston Lindsey Rowlett, Regina, Sask., Box 1004..... 6th May, 1905
D.L.S., Grad. S.P.S.

Patten, Thaddeus James, Little Current..... 5th Jan., 1883
D.L.S.

NAME AND P.O. ADDRESS. DATE OF ADMISSION BY BOARD.

Patterson, Frank Elliott,
Ottawa, Ont. ..... 21st April, 1909
Grad. S.P.S.

Paulin, Frederick William,
Niagara Falls ..... 11th May, 1908
Grad. S.P.S., Toronto.

Peckover, Horace Joseph,
209 Major St., Toronto. ..... 24th February, 1910
B.A.Sc., Toronto.

Pequegnat, Marcel, Berlin, Ont. 24th February, 1910
B.A.Sc., Toronto

Phillips, Henry Percy Argall,
Porcupine ..... 24th February, 1910

Pierce, John Wesley, Ottawa. ..... 20th Feb., 1909
D.L.S.

Pinhey, Charles Herbert, Ottawa.
110 Wellington st. ..... 12th Nov., 1888
D.L.S., Grad. S.P.S., Assoc. Mem. Can. Soc. C.E.

Proudfoot, Hume Blake, Ottawa ..... 6th Jan., 1882
B.A.Sc. (Toronto Univ.).

Rainboth, Edward Joseph, Ottawa. ..... 11th Nov., 1887
D.L.S.

Ransom, John Thomas, Toronto,
470 Manning Ave. ..... 22nd Feb., 1911
D.L.S. B.A.Sc.

Reinhardt, Carl, Box 303, Cobalt. ..... 25th Feb., 1899
B.A.Sc., McGill.

Robertson, James,
1170 Yonge St., Toronto ..... 11th July, 1885
Grad. S.P.S.

Roger, Alec, Ottawa South,
36 Seneca St. ..... 22nd Feb., 1911

Roger, John, Mitchell ..... 10th Nov., 1888
Grad. S.P.S.

Rogers, Richard Birdsall, Peterborough. ..... 9th Jan., 1879
B.A.Sc. (McGill), D.L.S.

*Rombough, William R. (not known) 14 Nov., 1848
D.L.S.

Rorke, Louis Valentine, Toronto,
199 Madison Ave., Inspector of Surveys .14th April, 1890
D.L.S.

NAME AND P.O. ADDRESS. DATE OF ADMISSION BY BOARD.

Ross, George, Welland .....10th July, 1879
A.M. Can. Soc. C.E., B.A.Sc. (McGill), D.L.S.

Ross, Kenneth George, Sault Ste. Marie...15th May, 1909
Grad. S.P.S.

Routly, Herbert Thomas, Haileybury..... 1st May, 1907
Grad. S.P.S.

Rubidge, Walter Frederick Brendon, Orillia.15th April, 1912

Russell, Alexander Lord, Port Arthur.....16th April, 1873
D.L.S., P.L.S. (Que.).

Rutherford, T. N., St. Catharines, Ont.....18th May, 1906

Seager, Edmund, Kenora ..... 8th July, 1861
D.L.S.

Sewell, Henry DeQuincy, Toronto,
34 Yonge st.....9th July, 1885
D.L.S., A.M.I.C.E.

Seymour, Horace Llewellyn, Edmonton, Alta..2nd May, 1908
D.L.S.

Shaw, John Henry, North Bay.....17th Feb., 1900
Grad. S.P.S.

Seibert, Frederick Victor, Southampton.....22nd Feb., 1912

Sibbett, William Algernon, Brantford.....6th May, 1912

Silvester, George Ernest, Sudbury.....12th Nov., 1892
Grad. S.P.S.

Sing, Josiah Gershom, Toronto, Room 71,
Confederation Life Building .....9th Jan., 1879
D.L.S., C.E., Public Works Dept.

Slater, Nicholas James, Ottawa,
193 Sparks St. ..... 22nd Feb., 1911

Smith, Charles Campbell,
Observatory, Ottawa. ..... 16th Feb., 1907
D.L.S.

Smith, George, Box 25, Lindsay.....7th April, 1881
Engineer for Co. Victoria and four Townships.

Smith, James Herbert, New Liskeard.....27th Dec., 1904

Smith, Walter, Lindsay.....16th Feb., 1907

Snow, Ernest Arthur, Berlin ..... 18th April, 1910

SPEIGHT, THOMAS BAILEY, Toronto,
703 Temple Building .....6th Jan., 1882
D.L.S., President Assoc. O.L.S.

NAME AND P.O. ADDRESS. DATE OF ADMISSION BY BOARD.

Steele, Ira John, Ottawa,
18 Rideau Terrace ..... 18th April, 1910
D.L.S.

*Stewart, George Alexander,.....8th July, 1852
D.L.S.

Stewart, John, (address not known).....11th Nov., 1887
D.L.S.

Stewart, Lionel Douglas Noble,
Collingwood ..... 24th February, 1910

Stewart, Walter Edgar, Aylmer .....12th April, 1892

Street, James Cunard, Ottawa,
81 McKay Street.....11th May, 1912

Stull, William Walter, Sudbury .....17th Feb., 1900
B.A.Sc. (Toronto Univ.).

Summers, Gordon Foster, Haileybury...11th May, 1908
Grad. S.P.S., Toronto.

Sutcliffe, Homer Wilson, New Liskeard,
Ont. .....11th May, 1908
Grad. S.P.S., Toronto.

Tate, Harry William, Toronto,
224 Wright Ave. ..... 30th April, 1911
Grad. S.P.S.

Taylor, William Emerson, Toronto,
122 Yorkville Ave. .....22nd Feb., 1911
D.L.S.

Taylor, William Verner .....7th Nov., 1896
Grad. S.P.S.

Tench, William Eastwood,
210 John R. St., Detroit, Mich .....11th Jan., 1878

Townsend, David Thomas,
C. P. R. Land Dept., Winnipeg. ..... 17th Feb., 1906
D.L.S., B.A.Sc., Toronto.

Traynor, Isaac, Dundalk .....16th April, 1873
D.L.S.

Turnbull, Thomas, Winnipeg, Man.,
C. N. R. Eng. Office.....6th July, 1878
D.L.S., C.E. (Toronto Univ.).

Tyrrell, James Williams, Hamilton, Ont.
Prov. & Loan Chambers.
7 Hughson St. S. ..... 8th April, 1885
C.E. (Toronto Univ.), D.L.S., Co. Eng. for Wentworth.

NAME AND P.O. ADDRESS. DATE OF ADMISSION BY BOARD.

*Unwin, Charles, Toronto, 126 Seaton st....12th April, 1852
D.L.S., City Surveyor.

Ure, Frederick John, Woodstock .....7th April, 1887
D.L.S.

van Nostrand, Arthur J., Toronto.
703 Temple Building..... 30th Oct., 1882
D.L.S.

van Nostrand, John, Toronto,
703 Temple Bldg. ..... 1st May, 1910

Waddell, William Henry, Edmonton, Alta....6th May, 1905
D.L.S.

Wadsworth, Vernon Bayley, Toronto,
51 Yonge St. ....9th April, 1864
D.L.S.

Walker, Alfred Paverley, Toronto, Room 508,
Union Station, C. P. Ry., Eng. Office.....6th Jan., 1882
D.L.S., Mem. Can. Soc. C.E.

Ward, Archeson Thomas,
Toronto, 703 Temple Building .....10th April, 1897

Warren, James, Walkerton, P.O. Box 190....7th Oct., 1864
D.L.S.

Watson, John McCormack, Orillia,
P.O. Box 224 .....13th April, 1892

Webster, William Gourlay, Brantford.....22nd Feb., 1912

Wells, Arthur Frederick, Sandwich, Ont...17th Feb., 1906

*Wetherald, Thomas, 210 Delatre St.,
Woodstock ..... 12th Jan., 1856
D.L.S., C.E.

Weekes, Melville Bell, Brantford .....17th Feb., 1900
B.A.Sc. (Toronto Univ.), D.L.S.

West, Robert Francis, Orangeville .....7th April, 1881

Wheelock, Charles Richard, Orangeville.....7th Jan., 1886
Treasurer County of Dufferin.

Whitson, James Francis, Toronto,
Dept. of Lands, Forests and Mines....9th Jan., 1886

Wiggins, Thos. Henry, Finch, Ont.....10th Nov. 1891
Grad. S.P.S.

Wilde, John Absalom, Sault Ste. Marie, 9th April, 1893

NAME AND P.O. ADDRESS. DATE OF ADMISSION BY BOARD.

Wilkie, Edward Thomson, Toronto ... ..11th April, 1891
D.L.S.

Wilkins, Frederick William,
Norwood, Ont.....6th Jan., 1877
D.T.S.

Williams, David, Port Arthur. .....9th April, 1864
D.L.S.

Wilson, Norman Douglas,
41 Murray St., Toronto. ... 24th February, 1910
B.A.Sc., D.L.S., A.M. Can. Soc. C.E.

*Winter, Henry, Thornyhurst .....11th July, 1853
D.L.S., C.E.

*Yarnold, William Edward, Port Perry,
P.O. Box 44 .....7th April, 1854
D.L.S.

Young, Alex. Campbell, New Liskeard.....15th April, 1912

REGISTERED AND WITHDRAWN FROM PRACTICE

The names of those who have become "Associates" under By-law No. 39 are marked *; and under By-law No. 45 are marked †.

NAME AND P.O. ADDRESS. — DATE OF ADMISSION BY BOARD.

Anderson, John Drummond, Trail, B.C....13th April, 1892

Anderson, William Beaumont, Halifax, N.S. ..... 14th Feb., 1903
Grad. R.M.C., B.A.Sc. (McGill), M. Can. Soc. C.E., D.L.S. R.C.E.

Apsey, John Fletcher, (not known) ... 6th Jan., 1886
Grad. S.P.S.

Bowman, Arthur Meyer, Mahan, Beaver Co., Pa. .....11th Nov., 1887
Grad. S.P.S., Staff of U. S. Engineers.

Bowman, Franklin Meyer, Bellevue, Allegheny Co., Pa. .....11th April, 1892
Grad. S.P.S., Engineer Structural Iron Works.

Brady, James, Victoria, B.C., P.O. Box 815..15th July, 1862
M.E.

Burnet, Hugh, Victoria, B.C.....5th April, 1887
D.L.S., P.L.S. (B.C.).

Cambie, Henry John, Vancouver, B.C.....8th July, 1861
D.L.S., P.L.S. (B.C.).

Carbert, J. Alfred, Medicine Hat, Assa....7th April, 1876
Dist. Eng. and Surveyor.

Carpenter, Henry Stanley, Collingwood....25th Feb., 1899
D.L.S., B.A.Sc., Toronto.

Chalmers, John, Edmonton, Alta. ..... 11th April, 1896
Structural Engineer, Dept. Pub. Works.

Charlesworth, Lionel Clare, Edmonton, Alta. .....14th April, 1896
Grad. S.P.S., Director of Surveys, Alberta, D.L.S.

NAME AND P.O. ADDRESS. DATE OF ADMISSION BY BOARD.

Coleman, Richard Herbert, Toronto, Can. Co. Offices, Imperial Bank Chambers .....6th Oct., 1877

Drewry, William Stewart, Ottawa, Dept. of the Interior .....5th April, 1883
D.L.S.

Ducker, William A., Winnipeg, Man.....6th April, 1882
D.L.S., P.L.S. (Man.), Swamp Lands Comm'r.

Edwards, George, Thurso, P.Q.....6th Jan., 1866
D.L.S.

*Ellis, Henry Disney, Kuching, Sarawak, Borneo .....7th April, 1877
D.L.S., Commissioner of Pub. Works and Surveys.

Empey, J. M., Drawer 2081, Calgary. 16th Feb., 1907
B.A.Sc., D.L.S.

Ford, Wm. Butterton, Wabana, Nfld.....21st Feb., 1898

Galbraith, John, Toronto, School of Prac. Science.....13th April, 1875
M.A., D.L.S., Prof. Engineering S.P.S.

Gibbons, James, Ottawa, Dept. of the Int..15th April, 1890
Grad. S.P.S., Dominion Topographical Surveyor.

Gibson, George, St. Catharines.....10th April, 1860
D.L.S.

*Harris, John Walter, Winnipeg, Man.....6th Oct., 1866
P.L.S. (Man.), D.L.S., Assessment Com.

*Harvey, Thomas Alexander, 239 Vernon ave., Long Island, N. Y. City.13th Nov., 1893

*Heaman, J. A. Eng. Dept., G.T.P. Ry., Winnipeg.

Henderson, Eder Eli, Henderson P.O., Maine.7th April, 1887
Grad. S.P.S.

Hermon, Ernest Bolton, Vancouver, B.C.....7th Oct., 1885
P.L.S. (B.C.), D.L.S.

Hobson, Joseph, Hamilton, 343 Bay St. S. ..... 3rd Oct., 1855
D.L.S.

Innes, William Livingstone, Simcoe.....14th April, 1892
C.E. (Toronto Univ.).

Jephson, Richard Jermy (not known). 7th April, 1877
P.L.S. (B.C.), D.L.S.

NAME AND P.O. ADDRESS. DATE OF ADMISSION BY BOARD.

Johnson, Sydney Munnings, Greenwood, B.C. 9th Nov., 1895

Johnston, Robert Thornton, 15 Union Hall St., Jamaica, New York City 9th April, 1889

Kennedy, James Henry, Keremeos, B.C.....7th April, 1887
C. E. (Toronto Univ.), Chief Engineer V. V. & E. R. & N. Co.

*Kippax, Hargreaves, Huron, South Dakota. 7th July, 1877
C.E. (Toronto Univ.), Assistant to Surveyor-General.

Kirk, John Albert, Revelstoke, B.C.....6th July, 1877
D.L.S., P.L.S. (B.C.).

Klotz, Otto, 437 Albert st., Ottawa.....6th Jan., 1867
Dom. Top. Surveyor, C.E. (Mich. Univ.), LL.D.

Lane, Andrew, Sparrow's Point, Md.....4th April, 1895
Grad. S.P.S., Draftsman Maryland Steel Co.

Lendrum, Robert Watt, Strathcona, Alta....8th Jan., 1874
D.L.S.

Livingstone, Thomas Chisholm, (address not known) .....10th Jan., 1859
D.L.S.

MacLeod, Henry Augustus F., Ottawa, 340 Cooper st. .....11th Oct., 1856
D.L.S., C.E.

MacPherson, Duncan, Montreal .....9th Jan., 1884
Grad. R.M.C., M.I.C.E., Mem. Can. Soc. C.E., Div. Eng. East Div. C.P.R., D.L.S.

McCulloch, Andrew, Lake Nelson, B.C.....
Grad. S.P.S., Assoc. Mem. Can. Soc. C.E., City Engineer.

McGrandle, Hugh, Melaskawin, Alta. .....5th Jan., 1883
D.L.S.

Magrath, Charles Alexander, Lethbridge, Alta. 1st Nov., 1881
B.A.Sc. (McGill), D.L.S., P.L.S. (B.C.).

Marshall, James, Blyth. .....6th Oct., 1866
D.L.S.

Meadows, William Walter, c/o Director of Surveys, Regina ..... 21st Feb., 1898
D.L.S., Grad. S.P.S.

Miles, Charles Falconer, 268 Triangle st., Buffalo, N.Y. .....13th Jan., 1862

Moore, Thos. Alexander, (not known). 12th Nov., 1892

NAME AND P.O. ADDRESS. DATE OF ADMISSION BY BOARD.

Morris, Alfred Edmund, Perth, Ont.....10th April, 1879

Mountain, George Alphonse, Ottawa.....9th Jan., 1884
Mem. Can. Soc. C.E., D.L.S., P.L.S. (Que.), Engineer for Railway Commission.

Munro, John Vicar, New York, N.Y.,
359 West 31st st. .....9th April, 1895

†Paterson, James Allison. .....5th April, 1878
C.E., Mem. Can. Soc. C.E.

Pearce, William, Calgary, Alta.....12th Oct., 1872
D.L.S., P.L.S. (B.C.), Asst. B.C. Land Commissioner for C.P.R.

Reynolds, Samuel Henry, (not known).....17th July, 1880

Peterson, Peter Alexander, Montreal, P.Q...16th July, 1863
D.L.S., C.E. (Toronto Univ.)

Ponton, Archibald William, Macleod, Alta..9th April, 1880
D.L.S.

Purvis, Frank, (not known) ..... 7th April, 1875

Reid, John Lestock, Prince Albert, Sask....8th April, 1870
D.L.S.

Reiffenstein, James Henry, Ottawa,
Dept. of the Interior.....16th April, 1873
D.L.S.

Reilly, William Robinson, (not known). 7th April, 1881
D.L.S., P.L.S. (Man.).

Ritchie, Nelson Thomas, Kipiegan, Man.....9th Nov., 1888
P.L.S. (Man.)

Roberts, Vaughan Maurice, St. Catharines..5th April, 1887
D.L.S.

Robinson, Franklin Joseph, Regina.....21st Feb., 1898
Grad. S.P.S., D.L.S., Dep. Min. Pub. Works.

Ross, Joseph Edmund (not known).....11th Nov., 1890
D.L.S., P.L.S. (B.C.).

Sanderson, Daniel Leavens, Coral, Mich.....4th Oct., 1892

Saunders, Bryce Johnston, Edmonton, Alta—7th Jan., 1885
B.A.Sc. (McGill), D.L.S.

Shaw, Charles Aeneas, Greenwood, B.C.....6th Oct., 1877
P.L.S. (B.C.).

Sherman, Ruyter Stinson, (not known) 12th April, 1890
P.L.S. (B.C.).

Smith, Angus, Regina .....14th April, 1896
Grad. S.P.S., City Engineer.

NAME AND P.O. ADDRESS. DATE OF ADMISSION BY BOARD.

Smith, Henry, Toronto, Dept. of Lands, Forests and Mines ..... 8th Nov., 1861
D.L.S., Mem. Can. Soc. C.E.

Stewart, Elihu, Toronto ..... 8th April, 1872
D.L.S.

*Stewart, Louis Beaufort, Toronto, School of Prac. Science ..... 6th April, 1882
Dom. Top. Surveyor, Professor of Surveying.

Tracey, Thomas Henry, (not known). 8th April, 1870
C.E., P.L.S., (B.C.), D.L.S.

Vicars, John Richard Odlum, Kamloops, B.C. 5th Jan., 1887
P.L.S. (B.C.), D.L.S.

Wallace, Charles Hugh, Castle'erg, Co. Tyrone, Ireland ..... 9th Nov., 1889
C.E., (Trin. Coll. Dublin), Dom. Top. Surveyor., Asst. Co. Surveyor.

Wallace, James Nevin, Calgary, Alta ..... 21st Feb., 1898
D.L.S., B.A., B.E. (Trin. Coll., Dublin).

Weekes, Abel Seneca, Glencoe ..... 12th April, 1890
D.L.S.

Wheeler, Arthur Oliver, Calgary, Alta. ..... 8th July, 1881
P.L.S. (B.C.), D.L.S., Topographer, Dept. of Interior.

Wicksteed, Henry King, Cobourg ..... 7th Jan., 1886
D.L.S., C.E

SUMMARY.

Active members subject to dues	264
Active members exempted from dues	11
Withdrawn from practice (including nine Associates)	79
Dead	88
Total number enrolled since incorporation	442

DECEASED MEMBERS.

NAME	LATE RESIDENCE.	DATE OF P.L.S. CERTIFICATE.	DATE OF O.L.S. REGISTRATION.	DIED.
Abrey, George Brockitt	Toronto Junction	10th January, 1860	1892	25th June, 1906.
Aylsworth, Charles Fraser	Madoc	2 April, 1861	1892	27th June. 1911.
Aylsworth, William R.	Belleville	8th Nov., 1861	1882	22nd April, 1909.
Barrett, Russell H.	Pembroke		14th February, 1903	30th January, 1905.
Beatty, Walter	Delta	19th July, 1858	1892	——— ———, 1911.
Bigger, Samuel Howell	Ottawa		20th January, 1904	7th July, 1906.
Bolger, Francis.	Lindsay	10th October, 1863	1892	3rd November, 1895.
Bolger, Thomas Oliver	Kingston	6th July, 1865	1892	——— ———
Bolton, Jesse Nunn	Toronto	6th April, 1867		——— ———, 1901.
Bolton, Lewis.	Listowel	9th July, 1864	1892	18th July, 1910.
Bowman, Leander Meyer	Toronto.	14th April, 1892	1892	20th September, 1895.
Bray, Edgar	Oakville	6th October, 1866	1892	——— ———, 1908.
Brown, David Rose	Cornwall	10th October, 1850	1892	14th May, 1900.
Burke, William Robert	Ingersoll	5th April, 1878	1892	10th June, 1897.
Byrne, Thomas	Sault Ste. Marie	15th July 1862	1892	——— ———
Caddy, Cyprian F.	Campbellford	10th July, 1860	1892	—— August, 1905.
Caddy, Edward C.	Cobourg	18th December, 1846	1892	26th September, 1897.
Cameron, Alfred John	Peterborough	9 April, 1889	1892	12th January, 1912.
Cheeseman, Thos.	Mitchell	11th July, 1856	1892	——— ———, 1905.
Coad, Richard	Glencoe	8th October, 1879	1892	17th May, 1897.
Creswicke, Henry	Barrie	8th July, 1864	1892	22nd January, 1898.
Cromwell, Joseph M. O.	Perth	1st October, 1846	1892	19th October, 1897.
Davidson, Walter Stanley	Sarnia	9th April. 1884	1882	December, 1900.
Davis, John.	Alton	5th April, 1878	1892	8th November, 1907.
Deane, Michael	Windsor	26th May, 1848	1852	3rd April, 1897.
DeGurse, Joseph	Windsor	5th April, 1883	1892	22nd March, 1898.
Dobbie, Thos. Wm.	Tillsonburg	11th July, 1856	1892	——— ———, 1908.
Doupe, Joseph	Winnipeg	13th January, 1863	1892	——— ———, 1910.
Filmore, Stanley H.	St. Thomas		17th February, 1902	16th June, 1904.
FitzGerald, James William	Peterborough	13th July, 1857	1892	——— ———, 1901.
Foster, Frederick Lucas.	Toronto	9th April, 1863	1892	27th July, 1899.

NAME	LATE RESIDENCE.	DATE OF P.L.S. CERTIFICATE.	DATE OF O.L.S. REGISTRATION.	DIED.
Fowlie, Albert	Orillia	13th January, 1863	1892	—— April, 1898.
Fraser, Charles	Wallaceburg	5th August, 1847	1892	——, 1905.
Gamble, Killaly	Toronto		1888	17th June, 1912.
Gibbs, Thomas Fraser	Adolphustown	31st May, 1841	1892	17th April, 1893.
Gibson, James Alex.	Oshawa	7th April, 1855	1892	——, 1903.
Gilliland, Thomas Brown	Eugenia	11th July, 1868	1892	14th December, 1898.
Gilmour, Robert	Toronto	11th April, 1856	1892	29th December, 1903.
Hanning, Clement George	Preston	19th July, 1858	1892	7th May, 1905.
Haskins, William	Hamilton	5th July, 1855	1892	5th July, 1896.
Hermon, Royal Wilkinson	Rednersville	13th July, 1857	1892	9th February, 1907.
Hewson, Thomas Ringwood	Hamilton	6th July, 1877	1892	21st October, 1898.
Holland, Wm. Hugh	Toronto		1907 1st May	——, 1908.
Howitt, Alfred	Gourock	12th January, 1856	1892	6th May, 1896.
Irwin, James Moore	Rat Portage	13th January, 1863	1892	——, 1908.
Kains, Tom	Victoria	11th July, 1873		——, 1901.
Kirk, Joseph Green	Stratford	16th February, 1843	1892	22nd January, 1900.
Lynch-Staunton, Francis H.	Hamilton	11th October, 1856	1892	11th June, 1899.
Macdougall, Allan Hay	Port Arthur	4th April, 1859	1892	—— February, 1906.
MacMillan, James Alexander	Calgary	6th January, 1877	24th December, 1894	——. 1898.
MacNab, John Chisholm	Hamilton	8th January, 1880	1894	16th October, 1897
McAree, John	Toronto	6th April, 1867	1894	12th December, 1903.
McCallum, James	Fort Francis	30th March, 1849	1894	—— July, 1900.
McDonel, Augustine	Chatham	11th July, 1863	1892	——, 1908.
McGeorge, Wm. Graham	Chatham	8th January, 1866	1892	1st July, 1906.
McKenna, John Joseph	Dublin	9th July, 1860	1892	22nd September, 1910
McLatchie, John	Nelson, B. C.	9th January, 1864	1892	3rd February, 1908.
McLennan, Roderick	Toronto	20th June, 1846	1892	—— ——
Malcolm, Sherman Morgan	Blenheim	18th October, 1858	1894	13th January, 1899.
Niven, Alexander	Toronto	3rd July, 1859	1892	7th May, 1911.
Ogilvie, John Henry	Rat Portage	11th April, 1876	24th April, 1894	21st September, 1898.
Pedder, James Robert	Doon	10th November, 1891	23rd December, 1892	17th January, 1897.
Pope, Robert Tyndal	Ireland	13th April, 1875		——, 1905.

Proudfoot, Hart William	Saskatoon, Assa.	6th May, 1905			31st March, 1906.
Reid, James Hales	Bowmanville	6th October, 1866	1892		22nd December, 1899.
Robinson, William	London	—— May, 1846	1892		11th October, 1894.
Rubidge, Tom S.	Cornwall	9th February, 1849	1892		—— June, 1904.
Sankey, Villiers	Toronto	11th January, 1878	1892		10th July, 190
Scane, Thomas	Ridgetown	7th January, 1865	1892		—— ——
Schofield, Milton C.	Guelph	28th September, 1843.	1892		19th February, 1908.
Selby, Henry Walter	Toronto	8th January, 1876	1892		23rd August, 1910
Schwitzer, John Edward		16th November, 1896	1856		—— ——, 1911
Simpson, George Albert	Winnipeg	7th October, 1864	1892		8th January, 1905.
Spry, W.	Toronto	19th July, 1858	1892		—— ——, 1906.
Squire, Richard Herbert	Brantford	14th April, 1896.	1896		—— ——, 1908.
Stacey, Albert George			1908, 30th March		—— ——, 1910.
Steele, David Layton	Meaford		1905, 29th May		12th January, 1912.
Steele, Edward Chas.	Sault. Ste. Marie	9th April, 1889.	1892		—— ——, 1908.
Strange, Henry	Rockwood	30th November, 1838.	1892		March, 1908.
Strathern, John	B.C.	5th October, 1876	1892		—— ——, 1897.
Tiernan, Joseph Martin	Tilbury Centre.	7th January, 1886	1892		—— December, 1900.
Thomson, Augustus Clifford	Chicago	14th January, 1861	1892		—— December, 1896.
Van Buskirk, William Fraser	Stratford	7th April, 1883	1892		30th January, 1905.
Wagner, William	Ossowa	13th April, 1858	1892		—— ——, 1901.
Walsh, Thomas William	Simcoe	25th April, 1842	1892		14th March, 1895.
Wheelock, Charles John.	Orangeville	—— ——, 1856	1892		4th July, 1897.
Willson, Alfred	Toronto	6th October, 1866	1892		20th May, 1906.
Wood, Henry O.	Billings Bridge	10th October, 1855	1892		8th June, 1908.

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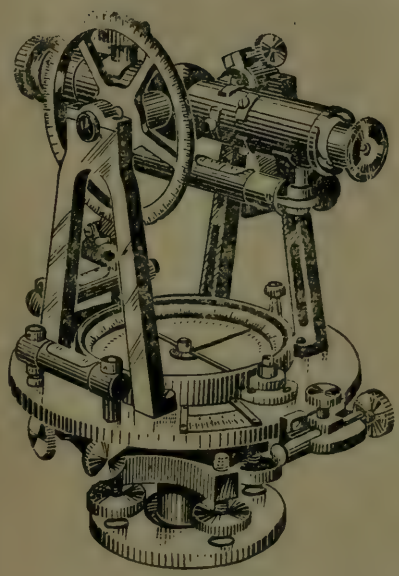

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TORONTO - - ONTARIO

NO. 28

Annual Report of the Association of

Ontario Land Surveyors

ORGANIZED 1886

INCORPORATED 1892

And Proceedings of the Twenty-First Annual Meeting Since Incorporation, Held at Toronto, February 25th, 26th and 27th, 1913.

Printed for the Association by The Business Printing Co., 184 Adelaide St. W., Toronto, Ont.

Patronize Our Advertisers

NOTICES

Copies of Annual Reports for past years can be supplied by applying to the Secretary. Price, 50 cents.

Members will please look up names of chairman of various committees and inform them of any interesting matter pertaining to that branch of the profession which may come to their notice or write to the Secretary.

Our library is now located at the Toronto Engineers' Club, 96 King St. West, and has been consolidated with the libraries of other associations in that building. Members have free and full access to all books in the consolidated library.

Published by Association of Ontario Land Surveyors. This edition 1,350 copies; price, 50 cents.

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PREFACE

To the Members of the Association of Ontario Land Surveyors:

The Proceedings of the Association at its Twenty-first Annual Meeting are herewith presented.

Respectfully submitted on behalf of the Council.

L. V. RORKE,

Secretary.

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ASSOCIATION OF
ONTARIO LAND SURVEYORS

Organized 23rd February, 1886. Incorporated 1892.

PAST PRESIDENTS

1886.	George B. Kirkpatrick	1900.	George Ross
1887.	George B. Kirkpatrick.	1901.	James Dickson
1888.	Alex. Niven.	1902.	W. R. Aylsworth
1889.	Alex. Niven	1903.	W. R. Aylsworth
1890.	Villiers Sankey	1904.	C. A. Jones
1891.	Villiers Sankey	1905.	J. W. Tyrrell
1892.	Elihu Stewart	1906.	O. J. Klotz
1893.	Elihu Stewart	1907.	Thomas Fawcett
1894.	M. J. Butler	1908.	A. J. van Nostrand
1895.	M. Gaviller	1909.	Lewis Bolton
1896.	Willis Chipman	1910.	H. W. Selby
1897.	T. Harry Jones	1911.	J. F. Whitson
1898.	P. S. Gibson	1912.	T. B. Speight
1899.	H. J. Bowman		

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H. T. Routly, Haileybury — For term ending April, 1915

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L. V. RORKE, Secretary of the Board.

NOTE.—Board meets at Department of Lands, Forests and Mines, Parliament Buildings, second Monday in February, 1914.

COMMITTEES, 1913-14

STANDING

LAND SURVEYING—C. J. Murphy (Chairman), E. T. Wilkie, H. J. Beatty, C. E. Fitton, J. W. Fitzgerald, H. M. Anderson, T. B. Speight, J. M. Watson.

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PUBLICATION—L. V. Rorke (Chairman), A. G. Ardagh, A. J. van Nostrand, J. F. Whitson.

ENTERTAINMENT—A. T. Ward (Chairman), G. S. Abrey, R. M. Anderson, T. D. Le May, John van Nostrand.

SPECIAL

LEGISLATION—G. B. Kirkpatrick (Chairman), J. W. Fitzgerald, C. H. Fullerton, H. T. Routly, T. B. Speight, J. M. Watson, J. F. Whitson, C. J. Murphy.

REPOSITORY AND BIOGRAPHY—Willis Chipman (Chairman), H. L. Esten, M. Gaviller, P. S. Gibson, A. E. Jupp, L. V. Rorke, A. L. Russell.

EXPLORATION—J. F. Whitson (Chairman), J. S. Dobie, R. W. De Morest, T. J. Patten, L. B. Stewart.

POLAR RESEARCH—Willis Chipman (Chairman), F. L. Blake, W. L. Malcolm, H. W. Sutcliffe, J. W. Tyrrell.

Programme of the

Association of Ontario Land Surveyors

(INCORPORATED)

At Its Twenty-First Annual Meeting Held at Toronto, February 25th, 26th and 27th, 1913

PROGRAMME

Tuesday, 25th of February—Morning, 10 o'clock

In the Engineers' Club

Meeting of Council of Management.
Meeting of Standing and Special Committees.

Afternoon, 2 o'clock

Reading of Minutes of previous Meeting.
Correspondence.
President's Address. — T. B. Speight.
Report of Council of Management.
Report of the Secretary-Treasurer.
Report of the Board of Examiners.
Report of Committee on Legislation. — G. B. Kirkpatrick, Chairman.
Report of Committee on Publication. — A. J. VanNostrand, Chairman.
Report of Committee on Topographical Survey. — Thos. Fawcett, Chairman
Report of Committee on Exploration. — J. F. Whitson, Chairman.
Paper.—"Colonization in Northern Ontario." — H. M. Anderson.
Paper.—"Aliquot Parts of Broken Township Lots." — J. S. Dobie.
Paper.—"Gold Mining in Yukon." — E. D. Bolton.
Paper—"International Boundary Survey East of the St. Lawrence River." — Thos. Fawcett.

Evening, 8 o'clock

Lecture on Panama Canal.
A. J. Grant, Superintending Engineer, Trent Valley Canal, Peterborough.
Paper—"Modern Engineering Improvements."
J. G. Sing, District Engineer, Ontario Division Dominion Public Works.

Wednesday, 26th February—Morning, 10 o'clock

Report of Committee on Land Surveying. C. J. Murphy, Chairman.
Report of Committee on Polar Research. Willis Chipman, Chairman.
Paper—"Methods of Subdivision Survey of Nine Mile Townships in Ontario." H. J. Beatty.
Paper—"Subdivision Surveys in Alberta." C. E. Bush.
Paper—"Boundary Line Between Augusta and Edwardsburg Townships." Willis Chipman.
Paper—"Diagonal Street Surveys in Great Britain and Canada." T. D. LeMay

Afternoon, 2 o'clock

Report of Committee on Engineering. Owen McKay, Chairman.
Report of Committee on Drainage. George Ross, Chairman.
Paper—"Forestry in Ontario." E. J. Zavitz, Supt. of Forestry in Ontario.
Paper—"Concrete Roads." W. A. McLean, Chief Engineer, Good Roads Dept.
Paper—"Notes on Wawaitan Power Plant." Robert Laird
Report of Auditors. J. W. Fitzgerald and R. R. Grant.

Evening, 7.30 o'clock

Dinner at McConkey's Restaurant.

Thursday, 27th February—Morning, 10 o'clock

Report of Committee on Repository and Biography. L. V. Rorke, Chairman.
Report of Committee on Entertainment. A. T. Ward, Chairman.
Nomination of Officers:—President, Vice-President, Secretary-Treasurer, two Members of Council, Auditors.
Unfinished Business.
New Business.
Adjournment.

Minutes of the Twenty-First Annual Meeting

—— OF THE ——

Association of Ontario Land Surveyors

HELD AT THE ENGINEERS' CLUB, 96 KING STREET WEST, ON THE 25TH, 26TH AND 27TH FEBRUARY, 1913.

The following members were present:

Abrey, G. S.
Anderson, H. M.
Angus, G. P.
Ardagh, A. G.
Attwood, Chas. H.
Aylesworth, C. F.
Beatty, David
Beatty, Herbert J.
Bell, Jas A.
Bolton, E. D.
Brown, W. H.
Burwash, N. A.
Bush, Clayton E.
Cavell, Ed.
Chipman, Willis
Code, R. S.
Code, R. W.
Cook, W. A. M.
Dickson, James
Doble, Jas. S.
Esten, H. L.
Fairbairn, R. P.
Fairchild, W. H.
Fitzgerald, J. W.
Flook, S. E.
Gibson, W. S.
Gourlay, Robt. M.
Grant, R. R.
Hellferth, J. B.
Hogarth, Geo.
Hutcheon, Jas.
Jupp, A. E.
Kirkpatrick, Geo. B.
Laird, Robert
Le May, T. D.
McEvoy, H. R.
McMullen, W. E.
Murphy, C. J.
Niven, D. Alex.
Patten, J.
Phillips, E. P. A.
Robertson, Jas.
Rorke, L. V.
Ross, Geo.
Routly, H. T.
Russell, A. L.
Rutherford, F. N.
Sewell, Henry DeQ.
Shaw, John H.
Speight, T. B.
Sutcliffe, H. W.
van Nostrand, A. J.
van Nostrand, John
Walker, A. P.
Ward, A. T.
Warren, Jas.
Watson, J. M.
Whitson, J. F.
Wilkie, E. T.
Wilson, Norman D.

On Tuesday, February 25th, at 2.45 p.m., the President, Mr. T. B. Speight, called the meeting to order and said:

Gentlemen, I think it is about time we commenced.

The President then read his annual address, which was received with applause.

The President—The meeting is now open for the transaction of business. The next order of business is the reading of the minutes of the last annual meeting.

Mr. Whitson—I am sure, gentlemen, we are greatly indebted for this valuable address of Mr. Speight's on this northern country of ours which has been criticized a very great deal. I am glad we have here to-day a man that has had the long experience which Mr. Speight has had, and anything Mr. Speight says in reference to our northern country I think the public, as well as this association can take for granted. It is not very long since reports were in our newspapers of our northern country to the effect that it was practically valueless, and that the reports read by the surveyors and others were misleading. Now I am not sure, but I think the public will take the statement that has been read here to-day, by a man who has spent the best part of his life in exploring Northern Ontario, rather than from a man who has made a hurried trip through the country during the worst season of the year on a train, and spending but two or three days in the district.

I am very glad to hear that Mr. Speight voices the opinion of our friend the late Mr. Niven. Mr. Niven had a long experience in that country and was very enthusiastic over the country. Mr. Speight is of the same opinion and I believe there are many gentlemen here to-day who have spent seasons in Northern Ontario who will agree with Mr. Speight's views—as to the future of our clay belt. I have nothing further to say. I would like to hear the remarks of some of the other gentlemen, who are here, on this paper.

It was moved by Mr. Sewell, seconded by Mr. van Nostrand, that the minutes of the last annual meeting be taken as read. Carried.

The President—The next is the report of the Secretary-Treasurer.

The Secretary, Mr. Rorke, read the report.

The President—What is your pleasure, gentlemen, with this report?

Mr. van Nostrand moved, seconded by Mr. Dickson, that the report of the Secretary-Treasurer be received and that the financial statement be submitted to the auditors. Carried.

The President—The next in order is the report of the Board of Examiners.

The Secretary read the report of the Board of Examiners prepared by Mr. Kirkpatrick, Chairman, and on behalf of Mr. Kirkpatrick moved the adoption of the report. Report adopted and ordered to be printed in the proceedings.

The President—The reports of the Council of Management and of the Committee on Publication will be presented later on. The report of the Topographical Survey Committee has not yet been sent in. The next is a paper by H. M. Anderson on "Colonizing in Northern Ontario."

The President—The next is a paper by Mr. J. S. Dobie on "Aliquot Parts of Township Lots."

Mr. Dobie—Mr. President and Gentlemen: The title of this paper, I think, would have been better to have read "Aliquot Parts of Broken Lots." The subject was suggested by a survey which came up in my practice, which involved so many unusual features I considered a short write-up of this survey and the subsequent decision of the courts, to whom the matter was finally referred, would be of interest to the Ontario Land Surveyors' Association. (Mr. Dobie then read his paper, together with a suggested amendment to be made to the Bed of Navigable Waters Act.)

The President—The next is a paper by Mr. E. D. Bolton on "Gold-mining in the Yukon."

Mr. Bolton—Mr. President, I have a few photographs, taken in the Yukon, if any of the members care to see them. They are principally of mining claims.

(The paper was then read and received with applause.)

The President—As to the next paper, Gentlemen, it has not yet been received, and Mr. Fawcett is not present.

The Secretary—Mr. President: On behalf of the Toronto Engineers' Club, whose lecture-room we are occupying, I would like to advise the visiting members that they are all honorary members of the Club while they are in the city, and if they wish to avail themselves of the opportunities of the Club, they will be heartily welcome during the stay. If they desire to make use of the dining-room, they can get tickets just the same as the regular members.

The President—I hope everybody will turn out to the lecture this evening by Mr. Grant.

The meeting then adjourned to meet at eight o'clock p.m.

In the evening at 8.30 p.m., the President introduced Mr. A. J. Grant, Superintending Engineer of the Trent Valley Canal, Peterborough, who gave a very interesting lecture on the Panama Canal. At the close of the lecture, the thanks of the Association were tendered to him, to which he responded, and the meeting closed at 10.30 p.m.

Morning Session, Wednesday, February 26th, 1913.

At 10.30 a.m. the President called the meeting to order and stated that the first item upon the programme was the report of the Council of Management.

Mr. Kirkpatrick read the report of the Council of Management, and after moving its adoption, said: With reference to the illegal practising of surveyors, we will have to get a clause in the Act. We will get the Legislation Committee to bring that up, so that we can see how we can get that changed to, say twelve months. The Criminal Code says six months, and it is too short a term. We tried that here in Toronto last year, and the Police Magistrate was going to find the man guilty, but his counsel brought up the section of the Criminal Code which stated that six months had elapsed, and so it had to go by the board; and therefore we think it would be better to change that and get a clause setting a time limit of twelve months. Then the assignment of marks for the final examination that is rendered necessary by the addition of several subjects which were added to the examination. One was the calculation of water powers, which is a very important thing nowadays. All surveyors are called upon to do that, and we added on some marks for that, and we have raised the minimum marks from 1,000 to 1,150.

Then, as to the matter of legislation confirming our changing the dates of the annual meeting, it was changed this time to enable the surveyors to meet here when the Good Roads Association met, so that they would get their fares cheaper; but I don't know that there is any idea of changing it. The Act says we shall meet on the third Tuesday. That had better remain probably as it is.

Another matter was considered, legislation as to the by-laws, but I thought we had given that up—the question of raising the fees for final candidates. I pointed out to the Committee yesterday that it was rather a dangerous thing to do because, when we first were incorporated we agreed to make it fifty dollars, and Mr. Hardy, who was then Premier, said it would look too much like a close corporation, and he would not advise it to be that. It had better be put at $30. The Association of Ontario Land Surveyors was the first and last close corporation that ever has been formed in the Province of Ontario, and it is not likely any other close corporation will be formed, and there might be some trouble in the House if we asked to raise it. Of course the object was to make the fees of the candidates exactly cover the expenses of the Association. It has done this hitherto with a very small difference, so that I really think it would be better to leave that alone.

Then the legislation regarding any proposed changes in the Survey Act. Of course there may be a few brought in after the Committee on Legislation meet. We had not a chance to meet; there was nobody here yesterday on the Legislation Committee, and therefore I think we had better let that stand over until we get the report of the Committee on Legislation.

Mr. E. D. Bolton seconded the motion that the report be received and printed in the proceedings.

Mr. Russell—I don't know whether I heard very well. Did I understand it was not necessary to post all the lots?

The President—Yes, that is the decision.

Mr. Russell—If you have the exterior properly located it is not necessary to post all the lots?

The President—Yes; that is the opinion of our Solicitor.

Mr. Russell—I notice it says that the width of every lot has to be shown. Sometimes these lots are mighty narrow, and it is a very difficult thing to get in all the widths; but as regards the length there is allowed a great deal of latitude. Now, where the lots are uniform, it seems to me that dots would be sufficient.

The President—The Master of Titles in Toronto is very strict about putting dots in; he insists on the figures being put in.

Mr. Russell—I think that will pass the Registry Office, because, from the information given there by the Solicitor, it would appear the widths have to be put in. Is it sufficient to put 33 feet here, and at the end of the row 33, and 33 in between? Would it be sufficient, instead of endeavoring to micrometer the information on the paper?

The President—If it is made sufficiently clear, so that it complies with the Registry Office, it goes. One thing they insist on now is that the ink shall be in black, and not in red, as the red ink fades.

Mr. Russell—Also, as regards the matter of bearings. It has been quite sufficient to put the bearings on the blocks, I think, without putting them on the individual lots?

The President—Yes.

Mr. Russell—Because the dimensions of the lots necessarily give their parallel or otherwise. A surveyor could replace those posts if they ever were put there, if the widths were ever given.

Mr. Kirkpatrick—The words, "Governing line," must go on.

The President—Supposing the bearings are not astronomical, they are calculated on an assumed sixteen degrees west, or whatever it may be, and all the bearings are calculated from relation to that.

Mr. Russell—Do I understand it is not necessary to take an observation on a subdivision; if the line is approximately north you can call it north?

The President—Yes, and then state your bearings are calculated on an assumed bearing north of Belmont Street, or whatever it is.

Mr. Russell—Would you have to refer to the name of the surveyor who had previously given that bearing?

The President—Then say that yours is calculated on that assumed bearing.

Mr. Dickson—There is one think I would like to draw the attention of the Association to for the purpose of getting their opinion. You are all aware that in preparing the plans for registration there are certain certificates that have got to be put on.

certified by the surveyor and by the owner of the property. Two years ago I was called upon to subdivide a block of land in Haliburton into village lots, and the man took it to the Registry Office, and he would not receive it unless there was a description of it by metes and bounds.

Mr. Russell—On the title?

Mr. Dickson—On the plan. I wrote to the Inspector of Registry Offices about it, and he insisted it should be done, and I had to get my plan back and sit down and write out a description and put it on the plan, the same as if I had described the aliquot part of a lot in a deed. My impression is that no Registrar has any authority to put more on a plan than what the statute requires, but I would like to have the opinion of this Association as to whether I am correct or not I told the Registrar I will do it this time, because this man I am working for is not rolling in wealth, but if it occurs again I shall apply to the courts for a mandamus to compel it.

Mr. Dobie—Do I understand you had to prepare a written description?

Mr. Dickson—Put it right on the face of your plan, the same as for a deed.

Mr. Dobie—That is a new thing for me.

The President—I might say that the Master of Titles is very glad to receive the description of the property that the plan is supposed to cover.

Mr. Dickson—Every line was laid down, and the bearings and the boundary of the township lot were all shown on the plan.

Mr. Russell—In that case a man would have to take an astronomical observation to give the proper description, if he has to give the proper bearings on the head of his plan.

The President—Astronomical bearings would make it better, probably, but he might be able to describe it without.

Mr. Dobie—I think, if a man had a reference meridian on his plan, and his angles checked with that, that is all that is required. I don't think it is necessary for a man to take an observation, because, if he did take an observation he might make a mistake; but if there is one line that can always be identified on the ground, I think the purport of that opinion is to have one line shown on the ground as the governing line, and have the bearings of all the other

lines referred to that particular line. The whole purport of the Act and our Solicitor's opinion, as I see it, is that the surveyor shall be compelled to put such information in that plan that any surveyor that comes along at any time afterwards shall be able to reproduce that plan, or any part of it, on the ground. Now, I know, in some of the northern Registry Offices, they will accept dotted measurements. You have a row of lots all 25 or 50 feet across the lot. If you put 25 in at the end of the first lot, and then go to the next, some of the offices will accept that and some will not.

Mr. Russell—I agree with Mr. Dobie, but with reference to what Mr. Dickson said about the description of the whole property, how can you describe that properly without having the astronomical bearings? It would be difficult to do that unless someone else had taken an observation that you could depend upon.

The President—The boundaries might be parallel to certain streets or lot lines, and if they are not parallel, bearings are calculated on the north or south or west boundary of the property.

Mr. Anderson—There is a point which occurs to me. We had in our town some plans prepared for re-subdivision of a former plan, and in compliance with the Act, the two surveys were shown in different colors. This plan had to come before the Town Council for their sanction. The second lot numbers (in one or two cases they are upon the same street) were in green for the former and in black for the latter, and the numbers were alike, and the Council, by reason of that, turned down the plan, and there had to be some readjustment of the numbers.

Another point we have made use of up there. We have found in the Registry Office and in the Land Titles Office very many plans are shown completely subdivided, and not complying with the suggestion of our Solicitor that the posts be planted. A man has to be a kind of Sherlock Holmes to know whether to look for a post or not, so that it has become our practice, rather than jot down a post at the four corners of each lot, to state in the form of a note just where on that plan posts were planted. We have a very strict man in the Registry Office and in the Land Titles Office up there; but the suggestion that has met with favor there is that, for instance, on a lot where you have forty feet eight and one-half inches, we have used the sign "ditto" on the plan that designates that 48 feet 8½ inches. That is by way of suggestion. The other I would like to have some information on.

The President—I think the Solicitor's opinion covers that.

Mr. Anderson—With reference to that numbering, have you had a similar case in Toronto? In this particular case, the old numbers were green, of the former subdivision; certain lots of them were re-subdivided, and, by a coincidence, black numbers and green numbers occurred on the same street, and it took an immense amount of juggling to get it so that that conflict would not occur, if not on this street, on some other street. I don't think the Council had any right to turn that down. Had it been a plan that did not have to go to them for sanction, the bearing would have gone through in that way.

The President—Put a note on the plan that the lines and figures in green represent so-and-so, and the lines in red represent so-and-so, and that the lines and figures in black represent the plan you are dealing with.

Mr. Anderson—It seems to me the municipality have exercised the power to turn this plan down, although it complied with the Act, but they, for the purpose of the rollkeeping and assessment books, would not pass it. I do not know that they had any authority to do that, but they seemed to have the authority.

Mr. Le May—Did the lots on the new plan coincide with the lots on the old plan?

Mr. Anderson—In one case they did, and in another case they were adjacent, within a lot or so.

Mr. Le May—With a view to the convenience of the public, it might be a reasonable suggestion for them to make, but I don't think the statute would give them any power to reject a plan.

The President then put the motion to adopt the report, and that it be printed in the proceedings, which, on a vote having been taken, was declared carried.

The President—The next is the report of the Committee on Land Surveying, by Mr. Murphy.

Mr. Murphy—I might say I thought to make part of my report, the opinion we got from our Solicitor, which Mr. Kirkpatrick has already read, and it kind of upsets the sequence of what I was going to say; but I can go on, and I will refer to that. (The report was then read.)

Mr. Murphy—The Statute of Limitations I refer to is that of 1910. It is Section 4, page 300, and refers to the real property. The statute seems to be a very old English statute, and it seems to have some bearing on that question.

The question which the Committee received is shown on the blackboard. (Here fill in question and answer submitted to Land Surveying Committee.)

Mr. Murphy—I move, seconded by Mr. Rose, that the report be received and printed in the proceedings.

The President—You have heard Mr. Murphy's explanation of this diagram on the blackboard, and the answer of the Committee. If anybody has any discussion or questions to ask, we will be very glad if they will take the opportunity now of doing so.

There being no response, the President put the motion to adopt the report, and that it be printed in the proceedings, which, on a vote having been taken, was declared carried.

The President—The next order on the programme is a paper by Mr. Sing, but I find he is not here. Will somebody move that if Mr. Sing does not come here before the meeting is over, that we will receive the paper, and that it be printed in the procedings.

Mr. Dobie—I would make a motion to the effect that Mr. Sing's paper be taken as read, provided Mr. Sing does not come to read it, and that it be printed in the proceedings.

On the motion being seconded by Mr. Dickson, it was put to the meeting and carried.

The President—The next is a paper by Mr. H. J. Beatty, on the "Methods of Subdivision of Nine Mile Townships in Ontario."

Mr. Beatty—I would say I am somewhat diffident about reading a paper on a matter such as this, owing to the limited experience I have had in subdividing nine-mile townships, but I trust that the remarks may lead to some discussion that will bring forth opinions from those who have had more experience that will be of benefit to the Association, as this nine-mile system will in the future turn out of considerable importance to the surveyors of the Province. (The paper was then read and received with applause.

The President—The next paper is one by Mr. Tracy D. Le May on "Diagonal Street Surveys in Great Britain and Canada."

Mr. Le May—I should like to take this opportunity of making two apologies. The first is that the subject of the paper does not exactly coincide with the title that is printed on the agenda; secondly, although what I aimed at was to get a calm survey, when I read what I had written over to one of my colleagues, he intimated

politely that it was more like the wailings of a soul in distress than a reasonable paper on diagonal roads. I have modified it to some extent, and I apologize now; otherwise, afterwards it might be too late.

(The paper was then read, and a number of diagrams, showing diagonal roads in a number of cities, were shown in connection with the paper. The paper was greeted with applause.)

On motion of Mr. Fitzgerald, seconded by Mr. Beatty, it was decided that a printed form be sent out with each ballot, with reference to assistance being given to Mrs. Cameron, the widow of the late Mr. Cameron, a member of the Association.

At 12.30 o'clock the meeting adjourned, to meet at 2.30 p.m.

AFTERNOON SESSION, WEDNESDAY, February 26th, 1913.

At 2.30 o'clock p.m., the President called the meeting to order and stated that the next order of business was the report of the Legislation Committee.

Mr. Kirkpatrick presented the report of the Committee on Legislation.

Mr. Kirkpatrick—(Speaking with reference to the Bed of Navigable Waters Act)—Some such clause as that would be necessary, as far as my point of view is concerned, to obviate the recurrence of a similar case to that which Mr. Dobie pointed out to you yesterday in his paper. It is not a question that the surveyors are going to bother very much over, but I should say that when the Government comes to consider it they would be the ones that are bothered. They have granted lots of islands in small lakes which the courts hold are not navigable for dreadnoughts, but which are quite navigable for steamers or for small launches. We have granted them always. According to this judgment of the court, all those islands and lakes are held by the original patentees as far as I know, and that is absurd, because, from time immemorial, every surveyor that was instructed to survey a township was instructed to put on the plan the area of the lot, area of the land, area of the water, area of the road—total area of the township so much. Of course, in the older parts of the Province, there were very few lakes found. When they began to survey all the townships north of the range along Lake Ontario, this was put in, and it has been the invariable rule in all townships to give the area of the lots, area of the water, area of the roads, and if there was

a road allowance laid around the shore of every lake that was not a lot, that was not part of the lot, it was a road just as much as any road. Then Mr. Scott, the Master of Titles, has spoken to me over and over again as to whether it is advisable to put in reserving a road allowance one chain in front of a lake. I said it is tautology; it never formed part of that lot; but we put it in sometimes to give the information that he does not go to the lake, that he only goes to the road; but there is no doubt about it, it is tautology, when the road is there, to put in reserving a road one chain in front, but it is done very often on purpose to show it. The plan shows it, and the field notes show it, and it forms no part of the lot any more than the concession roads or side roads. I move the adoption of the report, Mr. Chairman.

Mr. Rorke: I second that.

The President put the motion that the report be accepted and printed in the proceedings, which, on a vote having been taken, was declared carried.

The President—The next subject on the programme is a short paper by Mr. C. E. Bush on "Subdivision Surveys in Alberta."

The Secretary—Mr. President: Mr. Bush gave me his paper yesterday, and said he was not sure whether he would be here or not. I have the paper here. I would move, if it is the pleasure of the meeting, that it be taken as read, and printed in the proceedings.

Mr. Code—I second the motion.

The President put the motion, which, on a vote having been taken, was declared carried.

The President—The next is an address by our good friend, Professor Zavitz, now recently appointed Superintendent of Forestry for the Ontario Government. I am sure it is a subject that should interest every surveyor in the Province, and we look forward with great pleasure to hearing the address and having it printed in the proceedings.

Professor Zavitz then read his paper, which was received with applause.

The President—The next paper on the programme is a paper by Willis Chipman on "The Boundary Line between Augusta and Edwardsburg Townships." You all know Mr. Chipman is the father of this Association. Nobody has done more for its welfare

and for its interests, and I am sure we shall have great pleasure in hearing Mr. Chipman's paper.

Mr. Chipman—Mr. President and Gentlemen: I must apologize for not being here this morning, but I don't propose to inflict on you this paper to its full extent, but with the use of the blackboard I will point out the important points of the paper, which, if you consider it of sufficient importance, will be printed in full in the proceedings.

(Mr. Chipman then read his paper.)

The President—The next paper on the programme is "Notes on the Survey Act" by Mr. C. H. Fullerton.

The Secretary—The paper is not to hand.

The President—The next is a paper by Mr. W. A. McLean on "Concrete Roads and Pavements in Ontario." He is the Chief Engineer in the Roads Department.

The Secretary—Mr. McLean is absent attending the Good Roads Convention. Will Mr. Dobie kindly read the paper?

Mr. Dobie then read the paper.

The President—The next item is the report of the Committee on Drainage by Mr. George Ross.

Mr. Ross—I am afraid the Committee on Drainage is a good deal like some other committees. They have either no report at all, or very little to report, but as the Ontario Legislature meets mainly to revise the Ditches and Watercourses Act, it would be too bad to omit it altogether. (The report was then read.)

Mr. Ross—I would move the adoption of this report, Mr. President.

On the motion being seconded by Mr. Wilkie, the motion was carried.

The President—The next item on the programme is a paper by Mr. Robert Laird on "Notes on Wawaitan Power Plant."

Mr. Laird—Mr. President and Gentlemen: In the first part of the paper I give rather a description of the plant, and this is done for the purpose of showing the difficulties encountered. The title of the paper should therefore have been changed, but I hope this apology will be accepted. (The paper was then read.)

The Secretary—Mr. President, I wish to introduce a gentleman who was just hurrying from the room when I caught him, it is Mr. Thomas R. Deacon, Mayor of Winnipeg, the rising city of the West.

Mr. Deacon—Members of the Ontario Land Surveyors' Association, I assure you it is no desire on my part to inflict any speech on you. I was endeavoring quietly to make my escape after shaking hands with some of the old boys and having a bit of a chat, but Mr. Rorke and one or two others would not permit me to leave. I am very pleased to have had the opportunity of dropping in this afternoon and hearing some of the papers being read and shaking hands and talking over old times with some of the members I used to know in the days that are past. I notice that most of them like myself are getting a little gray on the temples, but we are all boys yet just the same. I cannot say much of interest at the present time. I have not been in touch with matters in Ontario for the last ten or twelve years or more. I have led a pretty strenuous life in other respects and have been really so engaged with other matters I have not had an opportunity to keep in touch with affairs in Ontario. In our western City of Winnipeg we have enough usually if a man is attending to his business, no matter what line he is in, to keep him pretty fairly occupied. Most people engaged in business there find that most other businesses are growing so rapidly and at such a rapid rate that it keeps them poor trying to keep up with them, putting on their additions and improvements as they go along. I have been engaged in one branch of engineering, bridge structural business for the last eleven years, and I thought I had about as much work on my hands as one able-bodied man ought to attempt, but recently towards the end of the year I inadvertently made some remarks about the water situation there, which was not in very satisfactory condition and I was induced to be a candidate at the last moment for the Mayoralty of the City of Winnipeg and was successful in the election. I might mention the grounds on which I was a candidate, which is of interest to members of the engineering or surveying profession. In the early days, up to 1899, the City of Winnipeg was supplied with water from the Assinaboine River, where the intake was, and it never was satisfactory. The water is hard and full of impurities, and there was a great deal of typhoid fever in the city at that time. The waterworks were owned by a private company, and the city took them over in 1899 and undertook to sink a series of wells, and they were successful as far as the obtaining of water for a moderate population was concerned. At that time Winnipeg had a population of between 35,000 and 40,000, but as the city grew—and it is now something over 200,000—it became more difficult to get a sufficient

supply of water, and in 1906 a commission was appointed, which went very thoroughly into the matter. I was a member of that commission, although not connected with the City Council, and we employed a board of expert engineers in addition, who recommended either going to the Winnipeg River or Shoal Lake for a supply of pure soft water. The water we have is very hard and very pure, but there is not enough of it, and it is very destructive to plumbing and boilers; there is a certain amount of salt in it and it has a peculiar effect on the tubes of steam boilers; it cuts the tubes off just at the tube sheet and the boiler has to be re-tubed about every eighteen months.

However, when I was brought out as a candidate I announced my policy as being in favor of abandoning the well system altogether, notwithstanding we had spent upwards of two million dollars and are now spending another million dollars this winter in endeavoring to provide ourselves with a temporary supply. I advocated making a clean job of it at once and going to Shoal Lake; that is a big lake just west of the Lake of the Woods, which it empties into; it is really part of the Lake of the Woods; and I was elected on that policy, and I am endeavoring to put things in shape. It is going to be a big proposition. We have to carry the water in a pipe conduit about 100 miles. There are no great engineering difficulties in the way, not much rock, but there is considerable muskeg, which will require some ingenuity in laying the pipe across it, but all these things can be overcome, and I hope before the year is over to have put that scheme through. It is a pretty comprehensive scheme. I intend, if I am let alone, to formulate a scheme and lay it out so that it can be extended to provide water for the next fifty years, and to take care of a population of a million people, which I may possibly live to see in Winnipeg and its suburbs. I am not usually regarded as an optimist; I am more often referred to as a pessimist, or at least as being pretty careful in business matters, and in 1906 when I was on that commission I made a table showing that the population of Winnipeg had always been, since about 1875, approximately ten per cent. of the people between the head of the lakes and the mountain. I projected that table afterwards on an estimated basis of what the population would be from year to year for a period of some twelve or fifteen years, and my table showed that in 1923 Winnipeg proper would have a population of 520,000 people. It is now nearly seven years since I made that table. It is in the minutes of the Commission, and every year the population has exceeded my projected probable population; and on the same basis I think that by the year 1928 or 1930 probably, 15 to 17 years, there will be a population

west of the lakes of between ten and twelve millions of people, and of those a million or a million one hundred thousand will be resident in the City of Winnipeg. At the present time Winnipeg does not include all the people who are living together there. The western suburb of St. James, which a person riding on the street car could not distinguish from the city, and would not know where you passed the boundary line, has a population of about 8,000 people; it is just that the city has grown over the boundary. On our southern boundary, down the Red River, the rural municipality of Kildonan is rapidly becoming an urban municipality; there are about 4,000 people there; directly across the river is the town or city of St. Boniface, now connected by a number of bridges, and has a population of about 13,000 to 14,000. The new town of Transcona, a distance of six miles from the Red River, has already a population of about 2,000, although the shops have only been opened some few months; it is an incorporated town, and I have no doubt at all it will in the course of three or four years have a population of about 15,000 people. Then there are two other municipalities of St. Vital and Fort Garry, which are contiguous to the City of Winnipeg. Winnipeg will undoubtedly absorb all these municipalities in the course of time, probably within the next ten years, and it is a part of my policy to elaborate a scheme which will take care of an ample supply of pure fresh water for the population which will inhabit that area for the next thirty or forty years at any rate. After that some other man can have the job of solving any questions that may arise. I may say that at the beginning of the year, together with Judge Robertson, the Public Utilities Commissioner of Manitoba, and the Chairman of the Fire, Water and Light Committee in the City of Winnipeg, we have had a series of meetings with the representatives of eight of the municipalities surrounding the city, and we proposed that they all come in on this scheme. We were successful and we have had eight of them come in together, and we had a special Act drawn, which was prepared by Judge Robertson, the Chairman of the Fire, Water and Light Committee, and myself—a very comprehensive Act, embodying 97 clauses, creating a new corporation called the Corporation of Greater Winnipeg Water District. And the arrangement to handle this scheme is that an administration board shall be appointed, of which the Mayor of the City of Winnipeg will always be the chairman, and four members of the Board of Control will always be members of that administration, and the mayors and reeves of the other municipalities, and this Administration Board will then appoint three commissioners, who will administer the affairs. It is our intention to bring water and distribute it in bulk in the municipality and the municipality will distribute it to their

consumers themselves and look after the distribution and collection of rates, the municipality contributing to the cost of the pipe line in proportion to the assessed value of the lands in each of these municipalities. It is quite a large job. My present idea is to have duplicate pipe lines. The first pipe line will deliver probably 25,000,000 gallons, and the estimated cost—I have gone into the records myself—will be somewhere about $7,000,000. The first pipe line will take three or four years to complete, and when that is completed we will start the second one in order to always keep ahead of the population. If I am able to carry out this scheme, I propose we estimate it will ultimately be an expenditure of $12,000,000. So that you can see, in addition to the enormous demand there is in the city for improvements, with the city growing so rapidly, we cannot do the physical work necessary of laying streets and grading streets and laying water mains and sewerage and pavements and public works of that kind. The City of Winnipeg itself has expended on a hydro-electric plant about a third more than the whole Province of Ontario. The Province of Ontario, I understand, has four million dollars invested. We have expended up to date over six million dollars and will have to expend before our plant is fully developed probably two million dollars more. We have a million dollars of bonds floated now at the last election for additional distribution, and it has only been running a year, and it is in very good shape financially. We have 100,000 horse-power available at the falls, dams and buildings are built, and although we have only 28,000 horse-power turbines, yet all we have got to do is to increase to 60,000 by putting additional turbines in as the city requires.

All this work, as you can readily understand, is enough to furnish a man with employment who is on the job and who is attempting to do his duty. I have a pretty large private business as well as the city's business, and I assure you that the present Mayor of Winnipeg has very few idle moments.

However, gentlemen, I am very glad to have had the opportunity to come in this afternoon. I would like to attend the dinner to-night, but I have a rather important appointment in New York to-morrow and I would not be able to put it off. I did not intend to speak only a few words. I am sorry to have kept you so long, but when I am explaining this thing it takes up more time than I expect. I thank you and wish you all every success. (Applause.)

The President—We thank Mr. Deacon for coming to the meeting this afternoon. It shows he has not lost his interest in this Association. I wish to thank him personally, as well as on behalf

of the Association. I think the last time I met Mr. Deacon was at Banff, in the Rocky Mountains, when the Board of Trade of Winnipeg were visiting that place. He was at that time Vice-President of the Board of Trade and president of the manufacturers' part of it. We have heard quite a bit in the press in the last few days about 20-storey buildings, but we have had an illustration this afternoon of a member of our profession rising to 20 storeys in the confidence of the people of Winnipeg. (Applause.) He is still the same T. R. Deacon as when I had the pleasure of working for him about twenty years ago, and living with him and knowing something of his executive ability and forceful character. Two or three years after that he moved to Winnipeg—some of you members may not know these facts—and started a structural steel company there in a very small way, but it now has developed into one of the largest steel companies in Canada, and he is President and Managing Director, as well as doing a little trifle as managing the affairs of the City of Winnipeg. It is another illustration of the old adage that if you want anything done, get a busy man to do it, and you will get it done well. Mr. Deacon, we are glad to have you here, and I am sure we all appreciate your wishes for our success. (Applause.)

As we have to attend the annual banquet this evening, we will now adjourn.

4.45 p.m. meeting adjourned to Thursday, February 27th, at 10 o'clock a.m.

THURSDAY, February 27th—10.30 A.M.

The President took the chair and called the meeting to order.

The Secretary—I have a letter from Mr. McKay, stating that he has no report yet to present.

Mr. Wilkie moved, seconded by Mr. Bray, that the report be taken as read, and printed in the proceedings when received. (Carried.)

The Secretary—The report of the Committee on Polar Research has not been received yet.

Mr. Dobie moved, seconded by Mr. Beatty, that the report on Polar Research be taken as read, and printed in the proceedings when received. (Carried.)

The Secretary then read the Auditor's Report.

The Secretary—Before a motion is made to adopt this report, I have an explanation to make, and I don't think of any other than thoughtlessness. Of course the late Treasurer's bond was sufficient up to the time of his death; and up to the last six months the thing was new to me, and the securing of a bond was put off from time to time until about a month ago. Then, on account of the nearness of the annual meeting it was left undone. I am not under bond, and I can assure you that I will not hand over the money to the new Secretary-Treasurer until he is under bond.

The President—I am sure the Secretary's explanation will be satisfactory to the members.

Mr. Grant—$860 overdue by members, equal to 215 members being in arrears for one year. I suppose some of those items are for many years past. Is there not some machinery in the Association so that we can in some way bring those chaps to time? $860 seems to be a large amount to have outsanding.

The President—It certainly is a large amount.

The Secretary—I would say, Mr. President, there are twenty members on the roll that are from five to fifteen years in arrears. (Voices: "Strike them off!") It seems useless for us to do anything. We have notified them to pay up their arrears. I don't know what machinery we can put in operation to strike them off. The balance consists of members that are in arrears from one to two years, and it is a matter of them settling up in a year or two. But I think there should be stricter regulations, having them pay up every year.

The President—In seven years these are outlawed.

Mr. Grant—As I understand the law, a man has no right to practise if he is in arrears.

Mr. Dickson—But the judges don't take that view of it. I remember being a witness on a case, and I objected to the evidence of a witness on the other side being received, as being the evidence of a surveyor, on the ground that he was in arrears; but the judge received his evidence. However, I think, strictly speaking, according to law, a man should be struck off in a year, and not allowed to practise.

Mr. Wilkie—Mr. President: Mr. Dickson has brought up the point I was going to bring up. I was in a case where that question arose, and the judge took a very different view of it; and if it had not been for something else, his evidence would not have been received. The opposing counsel brought that in; he ascertained

the standing of the man, but it was decided on another point which his standing did not affect. I think members in active practice are making a mistake when they let themselves get in arrears; they never know, when they are on a case, whether it is going into court or not, and if it does, ten chances to one it goes against them and they may lose their case.

The President—It serves them right.

Mr. Wilkie—I don't think it is the intention on any man's part, but I think it is his neglect, and it may go against him.

Mr. Russell—It is possible that some surveyors might be doing so little work they do not care about paying their fees; they let it slip their attention, or think what little they do will not affect them. For some of those belonging to no less than four different Surveyors' Associations, and with the fees running in all those associations, it comes a little hard for them to keep up with all their fees. I belonged to the Quebec Association, and I never made a survey in the Province of Quebec—never had occasion to. I received notice from the Treasurer that unless I paid the fees, which amounted at that time to $175, and now will amount to about $450, I would be prevented from practising there. That is a funny state of affairs. I don't think it is fair, when you take into consideration I have never made a survey there.

The President—If a man does not want to practise he can retire, and if he wants to go back into active practice again, he can be reinstated.

Mr. Russell—I know of more than one who do so little work that really it isn't hardly fair to charge them any fees at all. When a man arrives at the age of 75 or 80, and he can get a little work, you should excuse him from paying fees altogether. I think after he reaches a certain age the fees should be eliminated.

The Secretary—There is a provision made that after a member has practised so long as he does not pay any fees. There are several members on that list now.

Mr. Russell—That is after you retire from practice altogether. I don't mean that.

Mr. Dobie—(Reads sub-section 5 of section 41 of the Act)—I don't know whether we have power to pass such a provision. I don't know whether it has ever been passed or not. I understand there are a number of old members of the Association that are in the position Mr. Russell speaks of, that have not been called on to

pay their fees. I don't know whether they come under a by-law that has been passed or not, or whether that matter comes under the leniency of the Association.

Mr. Dickson—I think when a man reaches a certain age he ought to be automatically allowed exemption from fees. I don't want to claim any exemption. It is a very small amount—a little over a cent a day. I have always paid it cheerfully, and trust I will always be able to pay it. But I think after a man has reached a certain number of years he ought to be allowed exemption. The statute should fix it without any by-law.

Mr. Dobie—I agree with Mr. Russell's contention that when a man has reached the age of 75 or 80 he ought to be allowed exemption from fees. At the same time, I think it would be subject to a great abuse. I think the cases should be dealt with individually. Any member retiring from active practice and wishing to do a little work now and then, I think could make application to have a by-law to cover his particular case.

The President—I think that is a good suggestion. I think we might leave the matter that way.

It was moved by Mr. Grant, seconded by Mr. John van Nostrand, that the Auditors' Report be received and adopted. (Carried.)

It was moved by Mr. Wilkie, seconded by Mr. Dickson, that the sum of $5 be granted to each of the Auditors for their services during this meeting. (Carried.)

It was moved by Mr. Ward, seconded by Mr. Sutcliffe, that the report of the Committee on Entertainment be received later and printed in the proceedings. (Carried.)

Mr. Rorke—I was not able to get a meeting of the Committee on Repository and Biography. I interviewed several and got suggestions from several, and I have put this in a short way. (Reads report.)

On motion of the Secretary, seconded by Mr. Bolton, the above report was adopted.

The following resolution was moved by Mr. E. D. Bolton, seconded by Mr. E. T. Wilkie:

That this Association feels it should not conclude this meeting without expressing the keen loss felt by the death of our late Secretary-Treasurer, Captain Killaly Gamble, and that the Presi-

dent and Mr. G. B. Kirkpatrick be appointed to draft a suitable memorial voicing our deep regret, and testifying to his unceasing energy and ability in performing his duties towards this Association, and that the same be embodied in our annual report.

Mr. Wilkie, in seconding this motion, said:

Mr. President: I have a great deal of pleasure in seconding that motion, and I feel the Association has sustained a considerable loss in the death of the Captain. However, it is the will of the Ruling Hand that all should go in that direction at some time.

The President put the motion, which, on a vote having been taken, was carried unanimously.

Mr. Russell—Mr. Chairman: Did not Mr. Ogilvie also belong to the Ontario Land Surveyors?

The President—Yes.

Mr. Russell—I think a motion should be made respecting him. All know what a magnificent career he had. Very few surveyors attain a position similar to the position he held—Commissioner for the Yukon Territory. He was a magnificent fellow in every way. When I was in Port Arthur I heard he was at the hospital there, and I went up to see him while he was ill.

Mr. Dickson—Amend the motion to include his name.

It was moved by Mr. A. P. Ward, seconded by Mr. R. R. Grant:

That this Association has learned with deep regret of the death of the following members during the past year: Messrs. Andrew Bell, W. A. Browne, Killaly Gamble, William Ogilvie, Henry Lawe, Frank Purvis and Charles H. Wallace. (Carried.)

Mr. Dobie moved, seconded by Mr. Sutcliffe, that the Secretary express to the Engineers' Club of Toronto our appreciation of their kindness in extending to us the privileges of their club-rooms, and also for the use of their lecture-room in which to hold this, our annual meeting.

Mr. Dobie—I am sure I speak for every member of the Association when I move the above resolution. I am sure we very much appreciate having the use of these rooms when we come down on our annual pilgrimage to Toronto.

The President—I am sure it is something we all appreciate, having this kindness shown us.

The motion was carried with applause.

It was moved by Mr. R. R. Grant, seconded by John van Nostrand, that the sum of $400 be granted to the Secretary in recognition of his services during the past year.

The President—I am sure, Gentlemen, we have been well served by our Secretary, Mr. L. V. Rorke, who has given a great deal of time and consideration to this Association, and I am sure nobody has anything but the kindest feelings for the manner in which he has served the Association.

The President put the motion, which, on a vote having been taken, was declared carried.

ELECTION OF OFFICERS.

The President—The first office to be filled is that of President.

Mr. Wilkie nominated Mr. J. S. Dobie.

There being no other nominations, Mr. J. S. Dobie was declared elected to the office of President.

Mr. Dobie—Mr. President: I would like to express my thanks for the honor that has been conferred upon me by the Association in electing me President. I am sure I could not express the way I feel. I can only assure the Association I will do everything in my power to deserve the honor conferred upon me.

Mr. Ward nominated Mr. J. W. Fitzgerald for the office of Vice-President, and there being no further nomination, Mr. Fitzgerald was declared elected to the office of Vice-President.

The President—The next office to be filled is that of Secretary-Treasurer.

Mr. Beatty—I have much pleasure in nominating Mr. L. V. Rorke. I don't think there is any man more competent for the position.

Mr. Rorke—Before the nominations are closed, I would like to state just where I stand. When your late Secretary, with whom I was intimately connected, not only in this Association, but in social life, left for his trip across the ocean, which proved to be his last, he asked me to look after the work while he was away, and I was happy to do so; and when the news came of his death, I immediately notified the Chairman of the Council. I thought it

wise to do so, because, as acting secretary, I could no longer carry on the business, as the cheques and receipts required a proper signature. The Council of Management saw fit to appoint me, and I felt it was a duty I owed to the late Secretary and also to this Association. He had a great many private papers in his desk, and I felt it was a duty that I should undertake for the balance of the year.

I thank you for the kind words that have been said. I have tried to do my duty, and if it is the unanimous desire of the members I shall only be too pleased to continue to do my duty, and serve in that way.

Mr. Dickson—There are two reasons why I think we should elect Mr. Rorke. One is that it is necessary that the Secretary should reside where our headquarters are, in the City of Toronto; and another is, I think he should be, as nearly as possible, a permanent officer. I think we do very well in nominating and electing Mr. Rorke.

There being no further nominations, Mr. L. V. Rorke was declared elected to the office of Secretary-Treasurer.

Mr. Rorke—I thank you for your kind words. It is only with the help of the members of the Association that any Secretary can feel the duty is light, and I trust the duty will seem as light as it has been in the last six months.

The President appointed Messrs. H. L. Esten and T. D. LeMay scrutineers of the ballots for the election of members of the Council for 1913.

The following nominations for members of the Council were then received:

Mr. C. H. Fullerton, by Mr. Dobie; Mr. A. T. Ward, by Mr. Grant; Mr. W. W. Stull, by Mr. Ward; Mr. J. W. Tyrrell, by Mr. Grant; Mr. E. T. Wilkie, by Mr. Dobie; Mr. G. S. Abrey, by Mr. Bolton.

Mr. Dobie nominated Messrs. John van Nostrand and R. R. Grant as Auditors for 1913.

There being no further nominations, the President declared these gentlemen elected auditors for 1913.

NEW BUSINESS.

Mr. Aylesworth—Mr. President: I have heard one very old and experienced fellow-surveyor in the Province of Ontario has expressed an opinion—I don't know whether it is a radical idea or not, but it looked to me, if it could be made feasible, a very good idea—that the surveyors should try and bring about a statute by which the surveyors could be appointed Registrars of the Province. The work is in a line with the surveyor's, and when the time comes we wish to retire it would be a position to go to. I don't say a Registrar has a sinecure. Members of Parliament, as they are retiring, are made Senators, and I think it would be very nice to have an Ontario Senate of that kind for the surveyors. It looks very rosy to me. I have heard no others express their opinions, but it looks very feasible as to its practicability. It seems surveyors have a great deal of experience in examining titles, and, excepting the lawyers, they are perhaps as expert at that profession as anyone else in the profession, and they would naturally make good Registrars; and if such a thing could be brought about—and I think the members of this Association make as many sacrifices as any other institution in Ontario—I don't think it is any more than the surveyors deserve.

Mr. Russell—I think Master of Land Titles ought to be included in that.

Mr. Aylesworth—We have an Association that has been incorporated 25 years, and I think a thing like that would be a good thing for us to go out and dust for—fight for. Let us do something. This might be like a tie that binds and binds us closer together. I think this would be a good move in the right direction for all of the Association, and I would like to hear some expression.

Mr. Beatty—With reference to the appointing of surveyors to the position of Registrars, I think the idea is a good one, but it is just butting in on politics. I think we would only be knocking up against a stone wall, and politicians wouldn't hear of it. I think the idea is good, because the experience of a surveyor would give him exceptional qualifications for the position.

Mr. Russell—I think if the surveyor and politics could be combined, this idea of Mr. Aylesworth's could be carried out.

The President—I think the only way is to run for member of Parliament, and get it in that way.

Mr. Dobie—I think even if that could not bear fruit for some time there is no harm in breaking the ground. I think the time will come when public opinion will do away with politics and pull, and that civil positions will be removed from the field of politics altogether. I think that time will come. In the meantime, I see no harm in casting your bread upon the waters in the hope that it may return. I don't know how it can be carried out. That, I think, is for the Committee of Management to think over and discuss to see if they can arrive at some practical way.

The President—Why not make a motion to that effect?

Mr. Russell—There are also positions of Inspectors of Weights and Measures. I think that question might be incorporated in the discussion.

While I am on my feet I would also like to refer to this. I have a standard of measurement from the Province of Quebec—one of these three-foot wooden standards. I have also one given to me by the Province of Ontario. I have been requested to get a standard from the Dominion. Now I have these different standards. That is a great mistake. I think that the Department of Inland Revenue, which is really responsible for the standard of Canada, should be the only department from which a standard should issue, and every Dominion Land Surveyor should get his from that one source, and always that source. They should have a standard 66 feet in length, and also make it 50, and a spring balance attached to it, so you can compare with others, and one showing the effect by temperature on the chain. This standard steel tape you are not supposed to use except to test your chain.

The President—That has been dealt with by the Council. They have been asking for some years for the authority to change and have all tapes, 50 or 100 feet, purchased by the Association and sold to the candidates and tested by the School of Practical Science.

Mr. Dobie—Mr. President: The Dominion Land Surveyor's Board issue a standard of measurement. It is very useful, and it is stamped. It cannot be used as a means of surveying, but only for testing. They turn them out in large quantities, and I think it might be well to get some and have our standard in conformity. That would be a good thing for the management to take up.

Moved by Mr. Dobie, seconded by Mr. Russell, that the Committee of Management take up the question of securing from the

Department of Inland Revenue an adequate standard of measurement, and ascertain what the cost would be. (Carried.)

Mr. Ardagh—I got a 33-foot tape from the Association tested, and whenever I make a survey and I fear I should be asked in a court of law, I test my tape with it out there on the ground. I go through the form anyway. Would not my survey be thrown out if I had used a tape I had not tested before the survey? Once or twice I have forgotten, and I have been in fear and trembling that I should be asked in court.

Mr. Dobie—Before every survey, or test it that day if he is making more than one survey?

Mr. Wilkie—Before every survey.

Mr. Aylesworth—I don't think we should be allowed to depart from the question of the appointment of surveyors to the positions of Registrars, and I move that this question be brought before the Council of Management, and that they bring in a report next year, when we can thresh it out.

Seconded by Mr. Sutcliffe. (Carried.)

Mr. Dobie—I think our programme is pretty nearly done. There is the question, however, of collecting fees from members who are in arrears. Now, the statement was made that there are a large number of members practising constantly among those who are not incapable of paying their fees. Where any are incapable of paying their fees, we should take up the specific cases. It appears to me this is a matter for the Council to take up. The Act expressly states that the Association has the power to sue as an ordinary debt for unpaid fees.

Mr. Ardagh—Get a Solicitor to write them a letter.

Mr. Rutherford—I think it would be a good idea to send these members a notification to either pay the fees or be suspended. I think that is customory in almost every society and club to-day.

Mr. Dobie—Would it not be well for the Secretary to communicate with the Solicitor for the Association and find out exactly what we can do. I don't know whether we can suspend a man or not. There is the question whether we can, and I think if there is any action taken it should be through the Solicitor.

Mr. Beatty—I don't know whether it would be necessary to bring in a motion or not, as the discussion has brought it before certain members of the Council, and it is altogether likely they will

take the matter up. The change in Secretary will afford us a get-away to a fresh start, and I think we will just suggest that he bring in a report by the next meeting of the Council of the actual condition of affairs.

Mr. Chipman—Mr. President: I have a matter which I would like to bring before the Association. I regret Mr. A. J. van Nostrand was called away, as he is the proper party to bring it to your attention.

The Engineers' Club, the Ontario Association of Architects and the Ontario Society of Engineers have made this place their headquarters. There is a movement on foot now that will soon be consummated, to combine the libraries of the three associations; that is, the books will be kept on separate shelves, and have one common index. The books will be free to all. We purpose holding a meeting very shortly, when representatives from each of these organizations which I mentioned will complete the method of cataloguing the books. Now, the question I wish to bring to your attention is: Will this Land Surveyors' Association come in? You have a library. It is not accessible. No one can get at it. There is no place more central than this. Why could you not arrange to have your library here? Your books and documents will be put in separate cases, so they could be removed at any time. I am not going to make a motion, but leave this with your Council.

Mr. Aylesworth—We all recognize Mr. Chipman, although he is such a juvenile fellow, as being the father of the Association, and when he speaks to us he speaks with authority; but he has not explained the terms, or what formality we must go through to accomplish this desirable result. A great many of the Land Surveyors are also Engineers, and I think this would be a desirable result to bring about.

Mr. Chipman—I am not in a position to mention terms. That was not mentioned at our meeting. That is a small matter. The question is getting your libraries together.

The President—We can safely leave this for the Council, and I think it is a step in the right direction.

Mr. Dickson—I think I recollect some two or three years ago a motion passed to rent more convenient buildings, and I think it was left with the Council to rent a suitable place, and I think there was nothing done in the matter.

The President—We have a room in the Temple Building.

Mr. Dickson—I think, then, the suggestion made by Mr. Chipman a splendid one, and one building would do the whole of us; it would be a benefit to all around, and I therefore heartily agree with his suggestion to leave it in the hands of the Council.

Mr. Dobie—Mr. President: There is one little matter I would like to attend to, taking cognizance of the fate of the Antarctic explorers. Mr. Chipman may have covered that in his Polar Research. If he has covered it, I have nothing further to say.

Mr. Chipman—Mr. Chairman: I should have made an apology to you. I brought this report on Polar Research with me, but forgot to hand it in, and unfortunately I couldn't get the committee together; there was not enough to form a quorum. So, with your permission, I won't read it. I could not read it today on account of the severe cold I have.

Mr. Rutherford—There is just one point I want to speak about, which has not been brought out in discussion. It has been brought to my attention several times in the last year that a man is allowed to register certain documents or certain plans, whether or not he is a qualified land surveyor, and sent to each Registry Office. Wouldn't it be well to have a list prepared of the properly qualified Ontario Land Surveyors and sent to each Registry Office. What brought this to my attention was this. I know of a good many documents registered by railway companies, not signed by a land surveyor, and several times I have had to make surveys with variations.

Mr. Ward—I think there is a provision somewhere that it is necessary that the engineers sign the plan.

The President—They are signed by the Chief Engineer.

Mr. Ward—In some cases they are, and in some cases they are never signed.

Mr. Aylesworth—I understand before a roadway plan can be registered it is necessary to have them signed by the engineer.

Mr. Beatty—You are wrong, I think, Mr. Aylesworth.

Mr. Wilkie—Mr. President: As I understand those matters, the Railway Companies make their plans for the right of way. They are signed by the chief engineer, and they are deposited in the Registry Offices. There is a confliction between the registered and the fyled. Those for the rights of way are not registered; they are simply fyled in the offices. When the Railway

Company wishes to purchase the land it is necessary for the Railway Company to supply sketches for the particular lands they require, signed by an Ontario Land Surveyor.

The right-of-way plans are simply fyled in the offices. As soon as we get our plans approved of by the Railway Board, they are fyled in the Registry Office. Where we proceed with the work we find we have to make changes, and then we make a new plan and fyle that. We require lands, and we have to make separate sketches, and they must be signed by an Ontario Land Surveyor.

The President—After a Company get a charter for a certain branch they can then deviate, and that plan is fyled with the Registry Office? They can still deviate on either side of that line shown by the plan?

Mr. Wilkie—I am not sure about that, as to the distance of deviation. I have not had occasion to deviate far, but we have the right to deviate the line where it is necessary. We can't do any damage to lands or do anything further until we deal with the owners of the land. If the line is reached, the plan must be prepared and fyled with the Ontario Railway and Municipal Board, approved of, fyled, and, with their approval, deposited in the Registry Office. It has no bearing on the lands as far as the lands are concerned up to that date. It gives them a right to deal with the owners, and if they cannot deal with the owners they have a right to expropriate. Then the plans must show definitely what we want, signed by an Ontario Land Surveyor.

Mr. Rutherford—The point I was taking was, when it comes to buying the property it is unusual to file a plan and the deed showing the exact position of the property, and the plan is not signed. Lots of times lately I have noticed that going through, and I don't think the Registrar should be allowed to register that plan. I think each Registry Office should be furnished with a list of men properly qualified to fyle deeds.

Mr. Wilkie—That is a matter taken up in that way that is going to take us far afield. The Registrar ought not to accept for registration a plan signed by any person other than a land surveyor; but this happens. A Registrar will accept anything that is offered him, if he gets his fees for it, and, as a consequence, as everybody knows, things are in a pretty mess.

I made a survey of a subdivision for a man three years ago. I told him distinctly he must have his plan ready for registration before he could issue the deeds for it. He sold his land according

to a plan of such-and-such a date, and deeded his land. I have never been able to find any plan bearing that date. I never made it for him; he wouldn't pay for having it done. The Registrar accepted that deed, and he never had the plan, which made endless trouble. If we are going to carry this plan so far as suggested, if the Registrar must know that it is the man that is fyling the plan that is qualified to make the survey, a Registrar would be justified to refuse to take the plan unless there was an affidavit attached.

A Member—There is a man doing conveyancing in a town close to where I am, and he described three parcels wrongly. No man under the sun can lay that lot out; it is an absolute impossibility.

Mr. Dobie—Mr. President: The question of lawyer's descriptions has been discussed. A great many Registrars I know consider the ordinary sketch that you attach to a deed as being part of the description, and are willing to accept sketches, and they don't really come under the Registry Act at all, because the Registry Act applies to deeds where they are made subject to that plan.

Mr. Aylesworth—I can't conceive of such a thing happening as Mr. Wilkie has mentioned. I know it couldn't get through in the county from which I come.

Mr. Wilkie—It is an argument in favor of the idea brought forward by Mr. Aylesworth that Surveyors are proper persons to be assigned the position of Registrars.

This case I mentioned happened in Almonte, the Registrar being a retired High School teacher, who accepts anything that comes. He doesn't know anything about descriptions, and is, I think, like a great many other Registrars.

Mr. Aylesworth—I guarantee you can't get that through in the County of Hastings.

Mr. Beatty—It seems to me the only way is to get after the Registrars, and see that the deed Registrars pay more attention to this very important matter.

Moved by Mr. Beatty, that the Council of Management memorialize the Inspector of Registry Offices that more attention be paid to the descriptions contained in deeds. Seconded by Mr. Bolton. (Carried.)

Mr. Speight leaves the chair. The same was then taken by Mr. Dobie.

Mr. Dickson moved that the thanks of the Association be tendered Mr. Speight for his untiring efforts during the year in which he has held office. Seconded by Mr. Beatty. (Carried with cheers, three cheers and a tiger being given.)

Mr. Speight—I am sure I thank you all for your kind expressions. I feel it is an honor to be the President of this Association. While I have done everything I could to help the Association and devoted my best efforts to its interests, I feel my efforts have been very feeble, and that I have no qualifications for an office of this kind; but now that I am an ex-President, my efforts will not lessen in the line, and I will do anything I can for the Association. I beg to thank you for your expressions.

On motion of Mr. Dixon, the meeting adjourned.

PRESIDENT'S ADDRESS.

BY T. B. SPEIGHT.

To the Association of Ontario Land Surveyors:

Gentlemen,—It is with pleasure that I exercise the privilege of extending to you a cordial welcome to this the Twenty-eighth Annual Meeting of organized Land Surveyors for Ontario.

Since our last annual gathering this Association has sustained a severe blow in the death of Captain Killaly Gamble, Secretary of the Association for nearly ten years, whose attainments and zeal during the past twenty-seven years contributed so much to the advancement of the interests of our calling. Other breaks in the ranks have been caused by the passing of William Ogilvie, the well-known explorer; Andrew Bell, W. A. Browne, Henry Lawe, and W. R. Rombough, all veterans and full of years; also of Charles H. Wallace, of late resident in Ireland. The list of active members now includes about 280 names, and nearly eighty others are on the retired list.

The past year has been eventful to the world at large. It has seen great strides towards the perfection of aerial navigation, and, on the other hand, war, with its horrors, has smitten parts of Europe with a heavy hand, while the end is not yet.

Canada's prospects in a material way continue to grow brighter beyond our earlier expectations. In fact, her only rival in this particular is Argentina, a country very similar to our own in regard to healthful climate and vast areas of prairie land awaiting cultivation.

The phenomenal development of railway construction in Canada has eclipsed all previous records. With a population one-tenth of that of our neighbor to the South, we completed in 1912 about 2,189 miles, not to mention 5,000 miles under construction, as against about 4,100 miles completed in the United States during that year. By the end of 1914 it is confidently expected that three great railways will serve us with through traffic from ocean to ocean. This form of progress naturally creates a demand for the services of the engineer and surveyor, and the year 1912 may be regarded as the best the country has yet seen.

It is a matter for congratulation that Imperialist sentiment has been growing in Canada, and while all may not agree with the method adopted by our rules for strengthening the bonds and hands of the Empire, few can be found who would shirk our plain duty in this direction.

Ontario has had her fair share of the general prosperity, and continues to lead in the matter of output of mineral, agricultural and manufactured products, with every prospect of still better things in store.

The progress of the arts and sciences has been keeping pace with the development of the more material side, as the largely augmented ranks of students at our Universities clearly show. In architecture we have been soaring, more particularly in the larger cities, and the present record of sixteen storeys for an office building is now being menaced by one of twenty storeys, reaching 250 feet above ground level. Land values have advanced in country and city, notably in the latter. A recent sale of land at Charing Cross, London, England, realized a price below that of central properties in Toronto. European methods are being studied in the matter of comprehensive town planning, and great benefits are expected to result in our urban and suburban districts, special legislation in that direction having been enacted.

It is not my intention to trespass too much upon your time, but I may be permitted to dwell somewhat in detail upon the resources and development of New Ontario, the field in which I have spent several months of each of the past thirty-six years, in private practice and in the public service. During that period the frontier has been gradually moved forward from Blind River, Bruce Mines, and Sault Ste. Marie, until now, with the recently acquired District of Patricia, we have a new ocean coast line six hundred miles in length on Hudson Bay. At the present rate of progress, one is safe in looking forward not more than five years to the possibility of being able to purchase a ticket at Halifax or Vancouver, and travel comfortably by rail to a seaport on either James Bay or Hudson Bay, as he may elect.

The surprising discoveries of mineral wealth in the Cobalt region about fifteen years ago aroused the curiosity of the dwellers in Ontario as to what might yet be hidden in the then practically sealed hinterland beyond it, and this sentiment took practical shape in the organized exploration of 1900 under the direction of the Crown Lands Department. An appropriation of $40,000 was made, and ten exploration parties were sent out, a geologist and a timber estimator being attached to each. The leadership of the

most eastern party fell to myself, and we made an exploration of the country north of Lake Abitibi by running a base line east from the 198th mile post on the Algoma-Nipissing District boundary for a distance of seventy miles to the interprovincial boundary, much muskeg being met with in the last 50 miles. A number of track and traverse surveys were made in addition. Party No. 2, headed by the late Alexander Niven, ran the same base line west from the 198th mile post for a distance of 102 miles, besides a certain amount of general exploration work. The field examined by these two parties disclosed an almost unbroken stretch of good clay land for a length of 120 miles, and reaching northward a further distance of about 50 miles.

The other parties operating to the west and south discovered continuations of this class of soil, and the now famous name of "Clay Belt" was applied to the whole region, comprising an estimated area of sixteen million acres. This estimate has since been found to have been unduly conservative.

Referring to Mr. Niven's report on his work of 1900, coupled with his knowledge gained in preceding seasons, we find: "Summing up the whole line, it may be said that from start to finish it runs through as fine a tract of farming land as can be found in Ontario. Where else in Ontario can a tract of land 100 miles square be found all alike level and good? Muskegs there are in it, of course. Seventy-five per cent. of the whole country could be cultivated as soon as cleared and the moss burnt off, and of the remaining 25 per cent., a considerable portion could be drained and cultivated."

My subsequent work in that region warrants me in fully corroborating Mr. Niven's words, and I am convinced that the Clay Belt, extending at least 350 miles from east to west, and with an average breadth of about one hundred miles, comes largely under the same description. In places sandy and gravelly ridges and areas occur, but this, in most cases, may be regarded as beneficial rather than otherwise, in furnishing material for road improvement, concrete construction, etc., needs which will be felt when settlement is attempted.

Allowing for these deductions, I feel confident that from 65 to 75 per cent. will be found to be good farm land, and that comprehensive drainage will make considerable addition.

Outcroppings of rock with mineral possibilities have been found in various parts, the value of which is yet to be demonstrated.

It has been suggested that the report of a surveyor is liable to take color from the fact that he may desire to justify the expenditure of public money on exploration work. A very slight consideration of such a theory should convince the critic that neither the surveyor nor the government has anything to gain by placing on record anything which is not honestly believed to be facts. Later investigations could not fail to bring discredit upon either or both, if the straightforward course had been deviated from.

In view of the above soil conditions, it seems reasonable to conclude that the clay belt of Ontario is more favored than the dead-level clay stretches in Manitoba, where farming has proven so successful. All are more or less familiar with the exhibits of farm produce from the Temiskaming region, and I can find no reason why the results there should not apply to the greater part of the clay belt.

As to the climate, there are, to my mind, no great difficulties to be anticipated. True, the winters are long and severe, but on the other hand, the long days of summer in that high latitude, which ranges from that of North Dakota to 50 miles north of Winnipeg, tend to promote and mature vegetation at a rate unknown in older Ontario. I have seen at Alexandria, 50 miles west of Cochrane, the intersection of the N. T. C. Ry. and T. & N. O. Ry., near the centre of the clay belt, nearly every variety of vegetable and flower common to older Ontario brought to maturity and with a yield not to be surpassed in York County. This is not an exceptional case, and it has happened more than once that potatoes which we saw in process of planting on our journey to the surveys in the latter part of May had, in the short space of three months, come to maturity, as our menu attested on the return trip.

Summer frosts are experienced occasionally; but was not this the case in the early settlements near Lake Ontario? It has been abundantly shown that the general opening up of farm, the elimination of peaty turf, and the introduction of drainage, work wonders in the way of banishing summer frosts.

In the matter of timber, it is not to be expected that the monarch pines, oaks, maples, etc., formerly flourishing in Southern Ontario can be found in the North. Instead, we meet spruce, poplar, balsam, tamarac, cedar and birch, usually within reach of the prospective settler, but of comparatively small girth and height, except in the vicinity of the rivers and creeks. The clearing of the land is therefore correspondingly lighter. The prevalence of moss gives to the uninitiated the impression that much of that country consists of swamp lands, but a more intimate acquaint-

ance corrects it. We find that the first fire consumes a part of the timber and kills the remainder. A second burning causes the dead timber to vanish, and with it the moss, transforming the apparent swamp into a stretch of country requiring the minimum of labor to prepare it for the plough.

Where drainage on a large scale will be found necessary, Nature has in nearly ever case provided outlets in the rivers which at intervals traverse the country.

These rivers constitute a tremendous asset in the shape of hydro-electric energy, a feature gaining rapidly in recognized value. In an exhaustive paper prepared by Mr. L. V. Rorke in 1910 this subject was ably dealt with, and while the available data was then necessarily somewhat meagre, detailed information on a part of the Mattagami River has since shown that his estimates were well founded. I am convinced that within the clay belt not less than one million H.P. will yet be harnessed and used by its inhabitants, supplying them with heat and with power for operating railways and for the many purposes for which it is already being demonstrated that the farmer can profitably utilize power. No doubt, in due course, the details of the potentiality of the various rivers will be procured by the Government, as has been done in Finland and other European countries.

The first requisite in opening up a district is transportation to and through it. On the southern boundary of this region the C. N. Ry. is now under construction. The National Transcontinental Railway passes through the heart of it, the first train load of grain having been shipped from Winnipeg, Manitoba, to Port Colborne, Ontario, in the end of 1912. At the latter point it was converted into flour with a delay of one day only, and re-shipped in that form, via Halifax, to South Africa. This new addition to our transportation facilities, although meaning so much in the advancement of a great territory, received but a passing notice in the daily press. The Temiskaming and Northern Ontario Railway already serves a considerable part of it, and the needs of the country will ensure a continuation of that line to James Bay in the near future. The Algoma Central Railway is expected to be completed as far as the town of Hearst during 1913, and a direct route from Sault Ste. Marie thereby made available.

Railways can, however, serve, directly, only a narrow fringe on either side of themselves, and, leading from them, highways must be constructed by the Province. The generous appropriation made for this purpose at the last session of the Legislature is being carefully and wisely expended by our Past President, Mr. J. F.

Whitson, and those who know him can rely upon it that the value of one hundred cents will be given for every dollar so expended.

It would seem desirable that the Government should demonstrate the possibilities of home-making in this new realm—for its area is equal to that of some of the kingdoms of Europe—by undertaking a series of "prepared farms" on a scale commensurate with the means of the average settler. Experimental farms serve the purpose of showing what a given district is capable of producing, but the "prepared farm" would give the intending settler an idea of the capital required to make a successful beginning. These farms could, later, be sold, upon time payments, if necessary, to any whose capital is sufficient to enable them to eliminate the hardships incident to pioneer life, and the public treasury would be reimbursed its outlay.

In my judgment, dairying and stock-raising should be capable of successful operation, and will eventually become general in this part of our Province, mixed farming being that which insures against the element of chance entering so largely into a district where any specialty is the sole support.

I must ask your pardon, Gentlemen, for having perhaps unduly extended my remarks on this particular hobby of mine, but my convictions, the growth of years of familiarity with this part of our heritage, are very strong, and must serve as my excuse for lack of brevity.

The meeting is now declared open for the transaction of the business of the Association.

REPORTS

SECRETARY-TREASURER'S REPORT.

Mr. Chairman—Having been appointed by the Council as successor to the late Secretary-Treasurer for the remainder of the year now closing, I have the honor to lay before you the report of the business of the Association transacted between 24th February, 1912, and the 22nd February, 1913.

After revising the minutes of the last Annual Meeting and compiling a complete alphabetical index of the contents of the several annual reports since 1886, the matter was put in the hands of the Business Printing Company of Toronto for publication. Copies of the Annual Report were mailed, as far as possible, to the address of all members who are fully paid up or under two years in arrears for fees, and also expressed as follows:

To the Ohio Engineering Society	200 copies
To the Illinois Society, Engineers and Surveyors	200 copies
To the Iowa Civil Engineers' and Surveyors' Society	200 copies
To the Indiana Engineering Society	175 copies

We still have on hand 200 copies for sale or distribution. Reports of the above-mentioned sister societies were received and distributed in like manner.

Our thanks are due the various departments through whom we have received their Annual Report, as follows:

United States Coast and Geodetic Survey, Geological Survey of Canada, Ontario Bureau of Mines, Department of Forestry (Ottawa), Topographical Surveys (Ottawa), Commission on Conservation (Ottawa), City Engineer's Department (Toronto).

The official Register of Members has been revised from time to time, as changes occur to make it necessary, and now tabulates as follows:

Active Members	273
Withdrawn from practice	84
Deceased	94
Total Roll	451

During the year seven members have been added to the deceased list; five have withdrawn from active practice, and eighteen newly licensed men have been added to the active roll.

The office of the Association has been continued at 701 Temple Building, at a monthly rental of $15.

The Financial Statement herewith shows the various business transactions of the past year, and the present condition of the Association's finances. There are no outstanding liabilities beyond the ordinary current running expenses.

STATEMENT OF BALANCES, RECEIPTS AND EXPENDITURES BETWEEN 24TH FEBRUARY, 1912, AND THE 22ND FEBRUARY, 1913.

Dr.

To	Balance in Savings Account, 24th February, 1912..	$2,228 70
"	Balance in Current Account, 24th, February, 1912.	1,656 22
"	Cash on hand 24th February, 1912.....	8 84
"	Receipts in Board of Examiners' Account, including Government Grant of $200 and regular fees....	1,279 00
"	Annual membership fees	914 00
"	Amount Collected from Advertisements and Reports.	98 00
"	Interest on 20 shares Consumers' Gas Co. stock....	100 00
"	Accrued interest on Savings Account.....	28 15
		$6,312 91

Cr.

By	outstanding cheques, 1912 balance	$ 90 00
"	Amount paid Auditors	10 00
"	Amount granted to Secretary-Treasurer.....	400 00
"	By Amount paid Stenographer for reporting Annual Meeting	50 00
"	Amount paid for postage	92 50
"	Amount paid for publishing Annual Report.....	463 40
"	Amount paid H. J. Beatty (Council), 16th April and 9th July	48 95
"	Amount paid C. H. Fullerton (Council), 16th April. and 9th July	47 25
"	Amount paid H. T. Routly (Council), 16th April and 9th July	44 20
"	Amount paid J. McC. Watson (Council), 16th April.	7 35
"	Amount paid for marking Standard Tapes.....	20 00
"	Amount, Freight, Brokerage, Duty, Cartage and Sundries	35 05
"	Amount paid for Rent of Office.....	180 00
"	Amount paid for Printing and Stationery.....	105 72
"	Amount paid Armour & Mickle, Solicitors.....	54 28
"	Amount of Premium on Secretary's Bond.....	7 50
"	Amount paid for 20 shares Consumers' Gas Company Stock	1,952 50

" Amount paid for rent of Lecture-Room for Annual Meeting	20 00
" Amount paid Board of Examiners, Session 1913	649 30
" Amount paid Board of Examiners, Session 1912	64 40
" Balance in Current Account	1,706 63
" Balance in Savings Account	304 35
" Cash in hand	18 28
	$6,371 66
Deduct outstanding cheques	58 75
	$6,312 91

The assets are comprised as follows:

Cash in Imperial Bank of Canada	$1,952 23
Twenty shares Consumers' Gas Company Stock	1,860 00
Office Furniture	150 00
Arrears in Members' fees, 50%	860 00
Cash on hand	18 28
Total	$4,840 51

Respectfully submitted,

L. V. RORKE,

Secretary-Treasurer.

AUDITOR'S REPORT.

We hereby certify that we have examined the Secretary-Treasurer's statement and bank accounts, and find them correct. We find that the Acting Secretary is not under bond.

R. R. GRANT,

J. W. FITZGERALD,

Auditors.

REPORT OF COUNCIL OF MANAGEMENT.

The Council of Management beg to report that owing to the death of Alexander Niven, O.L.S., one of the Board of Examiners of Ontario Land Surveyors, the Council appointed James F. Whitson as a member for the unexpired time of Mr. Niven. Peter Silas Gibson, another member of the Board, has also resigned. It will be necessary, therefore, to appoint two Examiners to succeed Messrs. Gibson and Whitson. The Council of Management at its meeting to-day appointed James F. Whitson and H. J. Beatty for three years.

In the matter referred to the Council by the Association re plans for registry, the Council obtained the opinion of the Solicitors, Messrs. Armour and Mickle, as follows:

The Secretary, Association of Ontario Land Surveyors, Toronto, Ont.:

RE PLANS FOR REGISTRY.

Dear Sir,—In answer to your communication of the 22nd August, I beg to express my opinion as follows:

Before referring to the provisions of the Registry Act and the Land Titles Act relating to plans, I would point out that plan is merely an illustration or reproduction on paper of the actual survey which has been made on the ground. If there is a difference between the work on the ground and the plan, the former governs. Therefore, nothing ought to be shown on the plan as surveyed or measured unless it has been actually done on the ground.

The provisions of the Registry Act affecting surveys for plans to be registered are sections 80 and 87; and the provisions of the Land Titles Act, which are practically the same, are in section 105 of the Land Titles Act.

By the provisions of the Registry Act, it is imperative, first, that an actual survey should be made, which, in my opinion, implies not only that the outlines or comprehensive boundaries of the whole tract to be subdivided should be measured and ascertained on the ground, but that the measurements and boundaries of each lot, street, lane, square, etc., should also be similarly treated; and the whole shown on the plan.

Secondly, the number of the township, city, town or village lot, and the concession or range in which the land to be subdivided

lies, must be ascertained and shown on the plan. Where the subdivision is made of land already shown on a registered plan, it is sufficient to show the lot or lots on that plan. Thirdly, the width, both at the front and rear of each lot of the subdivision must be actually measured on the ground, and shown on the plan. The depth of each lot shall also be measured on the ground, and some information given on the plan to show such depth. It is not necessary that the depth shall be shown on each lot, but sufficient information must be given in order to enable it to be ascertained with accuracy. Prudence dictates, however, that in order to avoid disputes all calculations should be made by the surveyor, and the results should be shown on the plan. This prevents disputes where inches or even feet are in dispute, and dispenses with the necessity for evidence as to such matters, and a possible difference of opinion respecting the same. Moreover, the surveyor making the survey has the only accurate data from which to make the necessary calculations.

The same remarks apply to the courses of the boundaries and division lines within the plan, as to which "information" only is to be given.

The boundaries and division lines within the plan are also to be ascertained from "information" sufficient to identify and ascertain them by reference to the governing line or lines. As I have formed the opinion that posts are not necessary, it is important that the courses of all lines within the plan should be ascertained on the ground and shown accurately on the plan by reference to the governing line or lines. If this is not done, the plan itself may be perfect, but the situation of the land subdivided is quite unascertainable by a reference to the plan simply. In my opinion, therefore, the surveyor should ascertain and show on the plan accurately the governing line or lines, and ascertain and clearly show on the plan how all lines run in the reference thereto. If this is not done, the result might be that a subsequent survey made in a dispute between two owners of lots on the plan might result in showing one boundary, while another survey made in another dispute between other owners might show a different result. There should, therefore, be an absolute governing line indicated both on the ground and on the plan, by and from which all lines on the plan are to be ascertained.

These are, in my opinion, all the requirements of the Statutes. There is no direction to plant posts, but if any posts are planted, it is imperative that their position be shown on the plan.

It is evident that a great deal has been left by the Legislature to the practice in the profession and the prudence of the practitioners, and to the known rules of law as to surveys. The primary rule, as I have pointed out, is that a survey must be made on the ground, complete in every respect. The plan is merely a reproduction on paper of what has been done on the ground.

The policy of the Act seems to be that enough information should be given to enable anyone to ascertain on the ground, from information given by the plan, first, the situation of the subdivided land by reference to some governing line, and secondly, the size and boundary lines of each lot in the subdivision.

Yours truly,

E. DOUGLAS ARMOUR.

Another matter was referred to the Council by the Association in the case of parties illegally practising as an Ontario Land Surveyor. Counsel points out that as the Ontario Land Surveyors' Act does not stipulate any time, whereas the Criminal Code limits the time to six months after the performance of the act, it would seem that there is room for amendment to the Act, wherein a time limit should be stipulated, in which proceedings may be taken under section 3 of 1st George V., chapter 41, because it is not often the case that full information and evidence can be collected within six months from the time of the performance of the illegal act. The Council of Management have asked the solicitor to draw up a clause giving a time limit at twelve months.

Another matter for the Council to consider is the revision of By-laws concerning the assignment of marks to subjects for Final Examination. A resolution will be submitted, authorizing a change of the By-law regarding marks.

Another matter to consider is By-laws regarding fees for Final Candidates.

Another matter to consider is legislation re the confirming or changing date of Annual Meeting.

Another matter to consider is legislation re any proposed changes necessary in the Survey Act. This must wait until after the meeting of the Committees on Surveying and Legislation.

Respectfully submitted,

GEO. B. KIRKPATRICK,
Chairman of Council.

REPORT OF BOARD OF EXAMINERS.

An adjourned meeting of the Board of Examiners met in the Board Room, Department of Lands, Forests and Mines, on Monday, April 15th, 1912, when the following candidates having passed the supplemental, were duly admitted as Ontario Land Surveyors, their certificates to bear date April 15th, 1912:

Alexander Campbell Young, New Liskeard.

Adam Mair Jackson, Dunnville.

Walter Frederick Brendon Rubidge, Orillia.

George William Coltham, Aurora.

The latter's certificate to be dated 1st May, 1912.

The Board of Examiners met in the Board Room, Department of Lands, Forests and Mines, on Monday, the 3rd of February, 1913.

The following candidates passed their preliminary examination:

John Russell Scott, Collingwood.

Kenneth Campbell, Toronto.

Edgar Lawrence Moore, Toronto.

Walter Napleton Stone, Toronto.

Charles R. Yates, Toronto.

The following candidates passed the required final examination:

Frederick James King Benner, Alvinston.

Edward Cavell, Toronto.

Richard Fforde Dynes, Pembroke.

Douglas Stewart Ellis, Kingston.

Samuel Evert Flook, Willowdale.

Colin William George Gibson, Toronto.

James Richard Gill, Sudbury.

John Benedictus Hellferth, Toronto.

Ernest George MacKay, Hamilton.

David Alexander Niven, St. Catharines.

Guy Lawrence Ramsey, Dunnville.

Walter Russell White, Ottawa.

Their certificates to bear date the 13th February, 1913, excepting the certificate of Douglas Stewart Ellis, which is to bear date February 12th, 1913. A few of the above not being quite out of their apprenticeship, their certificates will bear date as soon as their articles expire.

The following bonds have been approved and filed with the Provincial Treasurer, in accordance with the provisions of the Act respecting Land Surveyors, 1st George V., chapter 41, section 35:

George Hogarth.

Wilmot Johnston Baird.

James Martin McGregor.

Wallace Sinclair Earle.

Frederick Carleton Lane.

Robert Murray Gourlay.

William Lindsay Malcolm.

Frederick V. Siebert.

Oliver R. Blandy.

Alan M. Jackson.

Walter F. B. Rubidge.

Morton Milne Gibson.

Norval Clarence Boyd.

Alexander C. Young.

George W. Coltham.

James Cunard Street.

William Gourley Webster.

The following articles were filed by the undernamed pupils during the year:

Name of Pupil	Name of Surveyor	Residence	Date of Articles	Terms
Sturdy, R. O.	W. S. Gibson,	Toronto	Feb. 17, 1912	3 years
Goebel, N. J.	H. Johnston,	Berlin	Feb. 17, 1912	3 years
Mauser, C. J.	H. L. Esten,	Toronto	Feb. 17, 1912	3 years
Lanzon, Silvio	F. F. Clarke,	Toronto	Feb. 5, 1912	1 year
Temple, John B.	E. T. Wilkie,	Toronto	Apr. 22, 1912	1 year
Pierce, C. B.	J. W. Pierce,	Ottawa	Apr. 29, 1912	1 year
Nash, A. L.	A. M. Jackson,	Dunnville	May 1, 1912	3 years
Campbell, Chas. D.	E. O. Fuce,	Galt	Feb. 15, 1912	1 year
Crouch, Milton E.	J. L. Lang,	Sault Ste. Marie,	Mar. 10, 1912	1 year
Kinnear, L. A.	Geo. Ross,	Welland	Apr. 20, 1912	1 year
Traill, J. J.	A. E. Jupp,	Toronto	Apr. 27, 1912	1 year
Eadie, L. F.	G. S. Abrey	Toronto	May 1. 1912	1 year
Melson, J. W.	W. F. B. Rubidge,	Orillia	May 15, 1912	1 year
McDougall, S. G.	J. L. Morris,	Pembroke	June 12, 1912	1 year
Ramsden, V. H.	S. R. Crerar,	Toronto	Aug. 5, 1912	3 years

Respectfully submitted,

GEO. B. KIRKPATRICK,

Chairman of Board.

REPORT OF THE COMMITTEE ON PUBLICATION.

Mr. President.—After reviewing the stenographic report of our annual meeting, and collecting the necessary diagrams and reports, the publication of the annual report was placed in the hands of the Business Printing Company. 1,350 copies were printed and distributed to the Illinois Society of Engineers and Surveyors, Indiana Engineering Society, Iowa Engineering Society, Ohio Engineering Society, and also to the various Scientific and Literary Societies with which we exchange copies, and amongst our members in good standing.

Respectfully submitted,

L. V. RORKE,

Chairman.

REPORT OF COMMITTEE ON ENTERTAINMENT.

Your Committee on Entertainment beg to report as follows:

The annual dinner was held at McConkey's Restaurant on February 26th, and the following were present:

Guests.—Hon. W. H. Hearst, E. Douglas Armour, K.C., Dr. Ellis, S.P.S., G. G. LeMesurier, R. F. Stupart, F. Arnoldi, A. J. Ritchie, A. J. Grant, E. A. Zavitz, J. H. Pettit, Dr. J. S. Bach, A. E. D. Bruce, Col. Hay, H. A. C. Machin, Lt.-Col. W. Cowan, S. A. Griffin, F. Hartung, Jas. J. Kee, K. H. Farrell, B. G. Leigh, F. Mucklestone, Arthur Burke, R. A. Morine, J. B. Proctor, W. H. St. John.

Members of the Association.—G. S. Abrey, H. W. Tate, N. D. Wilson, W. Chipman, J. Hutcheon, J. F. Whitson, H. L. Esten, N. C. Lloyd, H. W. Sutcliffe, H. DeQ. Sewell, H. J. Beatty, E. T. Wilkie, C. F. Aylsworth, G. B. Kirkpatrick, A. L. Russell, J. M. Watson, James Dickson, N. A. Burwash, J. S. Dobie, W. McMullen, Robert Laird, E. P. A. Phillips, T. H. Jones, F. N. Rutherford, W. H. Brown, A. M. Jackson, J. T. Coltham, E. D. Bolton, A. T. Ward, A. J. van Nostrand, John van Nostrand, J. B Hellferth, R. W. Code, T. D. LeMay, T. B. Speight, L. V. Rorke.

The dinner was excellent and the speeches replete with wisdom and humor. The toast list, which included the usual patriotic and other toasts, was interspersed with songs and recitations by Colonel Hay, Captain Machin, H. deQ. Sewell, and others, and the relation of several amusing personal reminiscences by Dr. Bach and Mr. Aylsworth.

Your Committee wish to express their gratitude to all those who helped to make the evening a success, and would like to take this opportunity of reminding those members who were not present that the dinner only happens once a year and that it should be attended by every member that can possibly do so, as it is one of the surest means of bringing the members of this widely scattered Association into personal contact with one another.

Respectfully submitted,

A. T. WARD,

Chairman.

ASSOCIATION OF ONTARIO LAND SURVEYORS

ANNUAL DINNER

1913

REPORT OF THE COMMITTEE ON DRAINAGE.

Your Committee on Drainage for the year 1912 beg leave to report as follows:

At the last session of the Ontario Legislature, the Ditches and Water Courses Act was revised, and slightly amended in one or two minor particulars.

The following sub-sections were added to section No. 8, regarding the service of the notices to be given by an owner requiring a ditch:

(2) The owner or occupant of any land to be affected, who has been served with the notice mentioned in sub-section 1, may, within five clear days after service of the notice upon him, apply to the Judge to set aside the proceedings on the ground that the person who commenced them is not an owner within the meaning of the Act.

(4) If such application is not made, or, if made, is unsuccessful, the right of the person who commences the proceedings to do so, shall not thereafter be open to question, but shall be conclusively presumed.

Section 27 of the Ditches and Watercourses Act, provided that each of the municipalities, after the expiration of the time for appeal, or after appeal, shall pay the charges, to be borne by the owners in each of the said municipalities, but the Act is now amended so that the municipality in which the work was initiated is to pay charges and costs to be borne on account of the whole work, and that each of the other municipalities is to pay its portion of the cost to the municipality in which the work was initiated.

The wording of several other sections has been varied, but it is very difficult to see any material difference in the meaning of the two readings.

On the whole, the Municipal Drainage Act and the Ditches and Water Courses Act are working fairly satisfactorily, but there is in several quarters considerable dissatisfaction found with the decisions of the Judges in many counties, before whom trials under the Ditches and Water Courses Act are held, and the suggestion is made that it would be advisable to have cases coming up under this Act referred to an official like the Drainage Referee, or a Board like the Board of Railway Commissioners, where the cases could be handled in a common-sense manner.

A digest on the decision of some of the recent cases is herewith appended:

Assessment for Outlet-Drainage Area Benefit.—The proceedings were begun by a petition to the Council of the township of M., praying that, in order to drain a described area in that township, the C. River, which flows through a number of townships, might be deepened and improved. The petition was referred to a Civil Engineer, who prepared a report, plan and specifications, and an assessment of land in several townships, which, in his opinion, would be benefited by the proposed work. The corporation of H. township appealed unsuccessfully to the Drainage Referee, and then to the Court of Appeal, contending that the land in H. being comparatively high, had already a sufficient outlet, and would not use the proposed new outlet. Held that the mere size of the area is of little consequence in considering whether or not the assessment is lawful. Drainage water must not go merely to an outlet by means of which it satisfactorily escapes from the lands which are being drained, but to a "sufficient outlet," which, as defined in s. 2, sub-sec. 10 of the Municipal Drainage Act, means the "safe discharge of water at a point where it will do not injury to lands and roads." It is not sufficient, in order to escape from liability, simply to show that the first discharge was into a "swale, ravine, creek, or watercourse"; s. 3, sub-sec. 4. There must appear to be a reasonable connection between the source of the injurious water and the outlet, and, that being established, the legal right to assess under the statute, however large the area, follows. And, upon the facts of this case, the assessment was right and should not be disturbed.

Re Township of Huntley and Township of March, 1 O. W. N. 190 (CA)—(*Drains Overflow Flooding premises abutting the street.*) The plaintiff complained of damage to goods in his shop on the 27th of November, 1909, by the overflow of water from drains constructed by the defendants. On the day of the overflow there was an unprecedented rainfall, 4.35 inches of rain having fallen in 24 hours. The floor of the plaintiff's shop was two feet below the street level. Held, on the evidence, that the water which damaged the plaintiff's goods came from the overflow of the 10th Street drain; and that drain had been proved, by actual experience of 20 years, to be sufficient to carry off properly all the rainfall for that period, even on a previous occasion when there was a rainfall of 4.10 inches in 24 hours. The plaintiff said that the condition of affairs had been altered by the macadamizing of the streets and the filling in of the portion of a swamp upon which the plaintiff's shop was situate with sand or silt from the river. Held,

that the plaintiff, having consented to this, could not complain. Held, also, that the rainfall of the 27th of November was so great that it could not reasonably have been anticipated; it amounted to *vis major*.

Sum Kum Wo v. City of New Westminster, 15 W. L. R. 512. (BC)—*Engineer-in-charge—Good Faith—Materials.*) When the engineer employed to superintend the construction of a drainage system is constituted judge of the work done and materials furnished, he is not liable in damages if, rightly or wrongly, but in good faith, he condemns any of the work or materials. If the character of the materials to be used in an undertaking is specified with precision on the contract, the contractor has not right to use others, even though they may be of equally good quality.

Audet v. Ouimet, Q. R. 37 S. C., 385.

Mandamus—Notice—View—Damages.)—A letter written by the complainant's solicitor to the council of the municipality, stating that the land in question has been flooded by water from a drain constructed by the municipality, but not saying anything as to the drain's condition, and asking them to construct and maintain such drainage work as is required to relieve the land, is not a sufficient notice under section 73, of the Drainage Act to justify the issue of a mandamus. It is the claimant's duty to show that proper notice has been given if a mandamus is asked for, and objection to the sufficiency of the notice may be taken by the defendants at any stages of the action without pleading want of notice. The Drainage Referee, in trying an action, may proceed partly on view, but in so doing must follow strictly the directions of the Act, and not make the view without appointment or notice to the parties. If he do so proceed, however, his finding, though based partly on the view, may be upheld if the evidence supports it. A complainant is entitled to recover for any injury to the use and enjoyment of his land or for its depreciation in value, if caused by failure to keep a drain in repair, but not for depreciation in value based upon the alleged insufficiency in size of the drain as originally made, and the court holding, on the construction of the Referee's judgment, that this element had been allowed to enter into the computation of the damages, reduced them from $250 to $50.

McKim v. Township of East Luther, 1, O. L. R. 89 (C. A.)—*Drainage—Statues of Petitioners—Finality of Assessment Roll—Farmer's Sons.*—In proceedings under the Drainage Act the assessment roll is conclusive as to the statue of the persons mentioned in

it, and evidence is not admissible to show that a person entered on the roll as owner is in fact a farmer's son and has been entered on the roll as owner by the assessor's error.

Township of Warwick v. Township of Brooke, 1, O. L. R. 43 (C. A.)—*Costs of Repairs—Varying Appointment.*—Upon certain repairs to a drainage work becoming necessary, one of the townships interested directed their engineer to make a report, and he assessed the cost against the different townships in the proportions in which the original cost had been assessed, no proceedings having been taken under Section 69 or 72 of the Drainage Act, to vary assessment. Held, that this was the proper mode of apportionment and that, notwithstanding the wide wording of Section 71 of the Act, the Drainage Referee had no power to vary an apportionment made under such circumstances.

Township of Chatham v. Township of Dover, 8 O. L. R., 132 (C. A.).

Respectfully submitted,

GEO. ROSS,

Chairman.

REPORT OF COMMITTEE ON POLAR RESEARCH.

Mr. President,—Within the last two weeks the tragic disaster in the Antarctic by which Capt. R. F. Scott and party lost their lives, after reaching the South Pole, has shocked the civilized world. Not since the loss of the Franklin Expedition in the Arctic region in 1846, has public interest and sympathy been so aroused in Great Britain and in America.

The final dash to the Pole to find the Norwegian flag there floating, the return northward buffeted by extreme cold and continuous storms, the death of one of the party due to an accidental fall, the heroic sacrifice of another in an attempt to save the lives of the remaining members of the party, were recorded by Commander Scott a few days before his death—and within eleven miles of a depot of supplies which they were unable to attain. This last message of a brave man we append to this report, that it may be preserved as an inspiration to noble deeds.

The race for the South Pole between Scott and Amundsen began in 1910.

Capt. Scott's party comprised twenty-eight naval officers and scientists, and twenty-three men, selected from thousands of applicants. He took with him about twenty ponies, thirty dogs, two motor sleighs, with supplies for three years. It was generally conceded that this was the best equipped of any expedition that had ever sailed for the Antarctic.

Capt. Scott sailed from London in the "Terra Nova" for New Zealand on June 1st, 1910, thence to the Ross Ice Barrier.

In coasting along the Barrier eastward from McMurdo Sound, Capt. Scott, to his great surprise, encountered Amundsen at the Bay of Whales. Scott then returned westward, and decided to follow his former route to the Pole, landing his party without mishap at Camp Evans, McMurdo Sound. The "Terra Nova" then returned to New Zealand.

In March, 1911, the loss of his pony transport deferred his start, the delay no doubt contributing to the disaster that followed. On the outward journey the weather was severe, but the Pole was reached on January 18th, 1912, about a month after Amundsen. That this disappointment may have contributed to his tragic ending on his return journey, cannot be believed when we consider the character of the man as revealed in his message to the British people, written on March 25th, 1912, a few days before his death.

The "Terra Nova" returned to New Zealand on February 9th, 1913, bringing the intelligence of the disaster to Capt. Scott and party, at a point 155 miles south of the winter quarters at Cape Evans.

Capt. Ronald Amundsen, the Norwegian explorer of Arctic fame, sailed in the "Fram" on August 9th, 1910, with a more modest equipment than Capt. Scott. He placed his reliance entirely upon Siberia dogs, taking about one hundred with him. His party comprised men, with two years' supplies. He chose the route via South America, and left Buenos Ayres for the South in 1910. He reached the Great Ross Barrier on Jan. 14th, 1911, where his party landed, the vessel returning to Buenos Ayres.

On October 20th, 1911, he started for the Pole, 700 miles distant, which point he attained without mishap on December 14th-17, with four companies. The Norwegian flag was raised over a

tent within which records were left. The pole was found to be at an elevation of about 10,500 feet above the sea.

Amundsen arrived in New Zealand on March 6th, 1912, from which point he cabled his success.

It may be here noted that this modern viking in the sloop "Gjoa" with four men fought his way through the north-west passage from Baffin's Bay to Behring Straits, but it took three seasons. 1903-1906.

The South Pole race was won by Amundsen's skis and dogs over Scott's ponies and motor sleds, but it should be borne in mind that he left Buenos Ayres about a month before Scott left New Zealand, also that the weather in January, 1912, was much worse than in the preceding month.

Amundsen lectured at Massey Hall, Toronto, on January 25th. 1912, to a crowded house.

The banquet tendered Amundsen by the National Geographic Society at Washington, at which function Commander Peary performed the duties of toast-master, was a memorable event. the two heroes being photographed on this occasion.

Scott's farthest south, Dec. 30th, 1902 .....82° 16½′
Shackleton's farthest south, Jan. 9th, 1909.....88° 23′

In 1911, a German Scientific Expedition established a base in longitude 20 degrees west in Coate's Land, nearly opposite McMurdo Sound, and south of South America. The primary object, however, was not the discovery of the South Pole.

Mr. Douglas Mawson, who accompanied Shackleton in 1908 and 1909, made explorations for the Australia Government in the "Aurora" along the Antarctic Coast for nearly two thousand miles west of McMurdo Sound during the years 1911 and 1912. Recent dispatches inform us that two of his party were lost, and that he with six of his companions will be obliged to spend another winter in the Antarctic, having missed the vessel upon which the party was to return to Australia.

In Canada, valuable exploratory work was accomplished during the summer of 1912 by J. B. Tyrrell and L. B. Stewart, in the lands adjoining the south-westerly shore of Hudson Bay, the results of which will doubtless be forthcoming shortly in the form of a Blue Book.

The return of Mr. Vilhjalmur Stefansson in 1912 from Arctic Victoria Land, whither he went in 1908, has aroused renewed interest in the Canadian Arctic Archipelago. He lived intimately with the natives for a full year, rediscovering among them many blonde Eskimos. Mr. Stefansson lectured in Convocation Hall, Toronto, on February 1st, and has since organized a Scientific Expedition to the Arctic, to be financed largely by the Dominion Government. He and his party of twelve scientists intend to sail from Vancouver during the first week in June in a 247 ton whaler, provisioned for four years. Several of his party have had experience in Arctic and Antarctic exploratory work, but only one man from this Province, a graduate of Queen's University, Kingston, but not one Provincial Land Surveyor.

Capt. Amundsen now proposes to drift across the Arctic Ocean from Behrings Strait north-westerward, following the same route as DeLong and Nansen, but on a bearing sufficiently to the northward to pass within striking distance of the North Pole. May he succeed, and return in safety.

WILLIS CHIPMAN,

Chairman.

CAPT. SCOTT'S MESSAGE TO THE PUBLIC.

In Captain Scott's diary Surgeon Atkinson found the following, which is quoted verbatim:—

"Message to the public—The causes of this disaster are not due to faulty organization, but to misfortune in all the risks which had to be undertaken.

"One—The loss of pony transport in March, 1911, obliged me to start later than I had intended, and obliged the limits of stuff transported to be narrowed.

"Two—The weather throughout the outward journey, and especially the long gale in 83 degrees south, stopped us.

"Three—The soft snow in the lower reaches of the glacier again reduced the pace. We fought these untoward events with a will and conquered, but it ate into our provision reserve. Every detail of our food supplies, clothing, and depots made on the interior ice sheet, and on that long stretch of 700 miles to the Pole and back, worked out to perfection.

"The advance party would have returned to the glacier in fine form and with surplus of food, but for the astonishing failure of the man whom we had least expected to fall.

"Seaman Edgar Evans was thought the strongest man of the party, and Beardmore Glacier is not difficult in fine weather. But, on our return, we

did not get a single completely fine day. This, with a sick companion, enormously increased our anxieties. I have said elsewhere we got into frightfully rough ice, and Edgar Evans received a concussion of the brain. He died a natural death, but left us a shaken party, with the season unduly advanced.

"But all the facts above enumerated were as nothing to the surprise which awaited us on the barrier. I maintain that our arrangements for returning were quite adequate, and that no one in the world would have expected the temperatures and surfaces which we encountered, at this time of the year.

"On the summit, in latitude 85 degrees to 86 degrees, we had minus twenty to minus thirty. On the barrier, in latitude 82 degrees, 10,000 feet lower, we had minus thirty in the day and minus forty-seven at night pretty regularly, with continuous headwind during our day marches. It is clear that these circumstances came on very suddenly, and our wreck is certainly due to this sudden advent of severe weather, which does not seem to have any satisfactory cause.

"I do not think human beings ever came through such a month as we have come through, and we should have got through, in spite of the weather, but for the sickening of a second companion, Captain Oates, and a shortage of fuel in our depots, for which I cannot account; and, finally, but for the storm which has fallen on us within eleven miles of this depot, at which we hoped to secure the final supplies. Surely, misfortune could scarcely have exceeded this last blow.

"We arrived within eleven miles of our old One Ton Camp with fuel for one hot meal, and food for two days. For four days we have been unable to leave the tent, the gale blowing about us. We are weak. Writing is difficult, but for my own sake I do not regret this journey, which has shown that Englishmen can endure hardships, help one another, and meet death with as great a fortitude as ever in the past. We took risks. We knew we took them. Things have come out against us, and, therefore, we have no cause for complaint, but bow to the will of Providence, determined still to do our best to the last.

"But, if we have been willing to give our lives to this enterprise, which is for the honor of our country, I appeal to our countrymen to see that those who depend on us are properly cared for. Had we lived, I should have had a tale to tell of the hardihood, endurance and courage of my companions which would have stirred the heart of every Englishman.

"These rough notes and our dead bodies must tell the tale, but surely, surely, a great, rich country like ours will see that those who are dependent on us are properly provided for.

(Signed) "R. SCOTT."

"March 25th, 1912."

SURGEON ATKINSON'S SAD TASK.

Surgeon Atkinson and his party gathered the records and effects of the dead men, read the burial service over their bodies and erected a cairn and cross to their memory over the inner tent in which they buried them.

A record of the finding of their bodies was left attached to the cross. The party then searched for twenty miles south, endeavoring to discover the body of Captain Oates. It was never found, but another cairn and record were left in the vicinity to his memory.

It should here most certainly be noted that the southern party nobly stood by their sick companions to the end, and in spite of their distressing condition they had retained every record and 35 pounds of geological specimens, which proved to be of the greatest scientific value. This emphasizes the nature of their journey.

The search party then turned northward, having decided next to direct their efforts to the relief of Lieut. Campbell and the northern party.

The above despatch was written and signed by Lieut. E. R. G. R. Evans, R. N., who was Captain Scott's second in command.

BRIEF HISTORY OF THE SCOTT EXPEDITION.

Before the Terra Nova left for New Zealand, in March last, Surgeon E. L. Atkinson, bacteriologist, who had been left in charge of the Western party until Captain Scott's return, despatched A. Cherry Garrard and Demetri, dog-driven, with two dog teams, to assist the Southern party, whose return to Hut Point was expected about March 10th, 1912. Surgeon Atkinson would have accompanied this party, but was kept back in medical charge of Lieut. Evans, second in command, who, it will be remembered, nearly died of scurvy.

This relief party reached One Ton Depot on March 3rd, but was compelled to return on the 10th of March, owing primarily to the dog food running short; also to persistent bad weather and the poor condition of the dogs, after the strain of a hard season's work. The dog teams returned to Hut Point on the 16th of March, the poor animals mostly frost-bitten and incapable of further work.

Garrard collapsed as the result of an overstrained heart. His companion was also sick, and it was impossible to communicate with Cape Evans, the ship having left on the 4th of March, and open sea lying between Atkinson and Keesochane. The only men left sledged out to Corner Camp, to render any help that might be wanted by the Southern party. They fought their way out to Corner Camp against the unusually severe weather, and, realizing that they could be of no assistance, were forced to return to Hut Point, after depoting one week's provisions.

In April, when communication with Cape Evans was established, a gallant attempt to relieve Lieut. V. L. A. Campbell, leader of the Eastern party, was made by Surgeon Atkinson; C. S. Wright, chemist, of Toronto; Petty Officers T. S. Williamson and P. Keohane. This party reached Butter Point, when they were stopped by open water. Their return was exciting, and nearly ended in disaster, owing to the sea-ice breaking up.

A search party left Cape Evans after the Winter, on October 30th last. The party, which was organized by Surgeon Atkinson, consisted of two divisions, Atkinson taking the dog teams, with Garrard and Demetri in charge of a party including E. W. Nelson, biologist, Gran; W. Lashley, assistant motor engineer; Petty Officers T. Crean, Williamson, Keohane, and Steward Hooper, with seven Indian mules. They were provisioned for three

months, as they expected an extended search. One Ton Camp was found in order, and all provisioned.

Proceeding along the old southern route on November 12, Wright's party sighted Captain Scott's tent. Within it were found the bodies of Captain Scott, Dr. E. A. Wilson and Lieut. H. R. Bowers.

From their records the following information was gleaned:—

The first death was that of Seaman Edgar Evans, petty officer of the Royal Navy, official number 160,225, who died on February 17th, 1912, at the foot of the Beardmore Glacier. His death was accelerated by a concussion of the brain, sustained while travelling over rough ice some time before.

Capt. L. E. G. Oates, 6th Inniskilling Dragoons, was the next lost. His feet and hands were badly frost-bitten, and, although he struggled on heroically, on March 16 his comrades knew his end was approaching. He had borne intense suffering for weeks without complaint, and he did not give up hope to the very end.

Captain Scott writes:—

"He was a brave soul. He slept through the night hoping not to wake. But he awoke in the morning. It was blowing a blizzard. Oates said: 'I am just going outside and may be some time.' He went out into the blizzard, and we have not seen him since."

Scott adds:—"We knew that Oates was walking to his death, but, though we tried to dissuade him, we knew it was the act of a brave man and an English gentleman."

On March 16 Oates was really unable to travel, but the others could not leave him. After his gallant death Scott, Wilson, and Bower pushed northward, when the abnormally bad weather would permit them, but they were forced to camp on March 21 in latitude 79 degrees, 40 minutes south, long. 169 degrees, 23 minutes east, eleven miles south of the big depot at One Ton.

This they never reached, owing to a blizzard, which is known from records to have lasted nine days, overtaking them, and food and fuel giving out.

REPORT OF COMMITTEE ON LAND SURVEYING.

Your Committee on Land Surveying for the year 1912-13 beg to report as follows:

There has been very little new business for the Committee, only one question having been received. This has had the consideration of the Committee and the answer is annexed.

With regard to the matter of the certificate on registered plans and the posting of same, which was discussed at our last meeting,

it will be remembered that it was resolved that the opinion of our Solicitor be had on these points. The Secretary has handed in the Solicitor's opinion, which is as follows:

"Toronto, August 27th, 1912.

"*The Secretary Association of Ontario Land Surveyors, Toronto, Ont.:*

"RE PLANS FOR REGISTRY.

"DEAR SIR:—

"In answer to your communication of the 22nd August, I beg to express my opinion as follows:—

"Before referring to the provisions of the Registry Act and The Land Titles Act relating to plans, I would point out that a plan is merely an illustration or reproduction on paper of the actual survey which has been made on the ground. If there is a difference between the work on the ground and the plan the former governs. Therefore nothing ought to be shown on the plan as surveyed or measured unless it has been actually done on the ground.

"The provisions of the Registry Act affecting surveys for plans to be registered are Sections 80 and 87; and the provisions of The Land Titles Act, which are practically the same, are in Section 105 of the Land Titles Act.

"By the provisions of the Registry Act it is imperative first, that an actual survey should be made; which in my opinion implies not only that the outlines or comprehensive boundaries of the whole tract to be subdivided should be measured and ascertained on the ground, but that the measurements and boundaries of each lot, street, lane, square, etc., should also be similarly treated; and the whole shown on the plan. Secondly, the number of the township, city, town or village lot, and the concession or range in which the land to be subdivided lies, must be ascertained and shown on the plan. Where the subdivision is made of land already shown on a registered plan, it is sufficient to show the lot or lots on that plan. Thirdly, the width, both at the front and the rear of each lot of the subdivision must be actually measured on the ground, and shown on the plan. The depth of each lot shall also be measured on the ground and some information given on the plan to show such depth. It is not necessary that the depth shall be shown on each lot, but sufficient information must be given in order to enable it to be ascertained with accuracy. Prudence dictates, however, that in

order to avoid disputes all calculations should be made by the surveyor and the results should be shown on the plan. This prevents disputes, where inches or even feet are in dispute, and dispenses with the necessity for evidence as to such matters, and a possible difference of opinion respecting the same. Moreover, the surveyor making the survey has the only accurate data from which to make the necessary calculations.

"The same remarks apply to the courses of the boundaries and division lines within the plan, as to which 'information' only is to be given.

"The boundaries and division lines within the plan are also to be ascertained from 'information' sufficient to identify and ascertain them by reference to the governing line or lines. As I have formed the opinion that posts are not necessary, it is important that the courses of all lines within the plan should be ascertained on the ground and shown accurately on the plan by reference to the governing line or lines. If this is not done, the plan itself may be perfect, but the situation of the land subdivided is quite unascertainable by a reference to the plan simply. In my opinion, therefore, the surveyor should ascertain and show on the plan accurately the governing line or lines, and ascertain and clearly show on the plan how all lines run in the reference thereto. If this is not done, the result might be that a subsequent survey made in a dispute between two owners of lots on the plan might result in showing one boundary, while another survey made in another dispute between other owners might show a different result. There should, therefore, be an absolute governing line indicated both on the ground and on the plan by and from which all lines on the plan are to be ascertained.

"These are in my opinion all the requirements of the Statutes. There is no direction to plant posts, but if any posts are planted it is imperative that their position be shown on the plan.

"It is evident that a great deal has been left by the Legislature to the practice in the profession and the prudence of the practitioners and to be known rules of law as to surveys. The primary rule, as I have pointed out, is that a survey must be made on the ground complete in every respect. The plan is merely a reproduction on paper of what has been done on the ground.

"The policy of the Act seems to be that enough information should be given to enable anyone to ascertain on the ground, from

information given by the plan, first, the situation of the subdivided land by reference to some governing line, and secondly the size and boundary lines of each lot in the subdivision.

"Yours truly,

(Sgd.) "E. DOUGLAS ARMOUR."

From the above it is clear that the subdivision survey should be carefully and thoroughly done on the ground. On this point we were all agreed—that all posts or monuments planted should be shown on the plan, but it is left to the judgment of the surveyor where they should be planted, if at all. It does not seem desirable that it be obligatory that all the corners be posted.

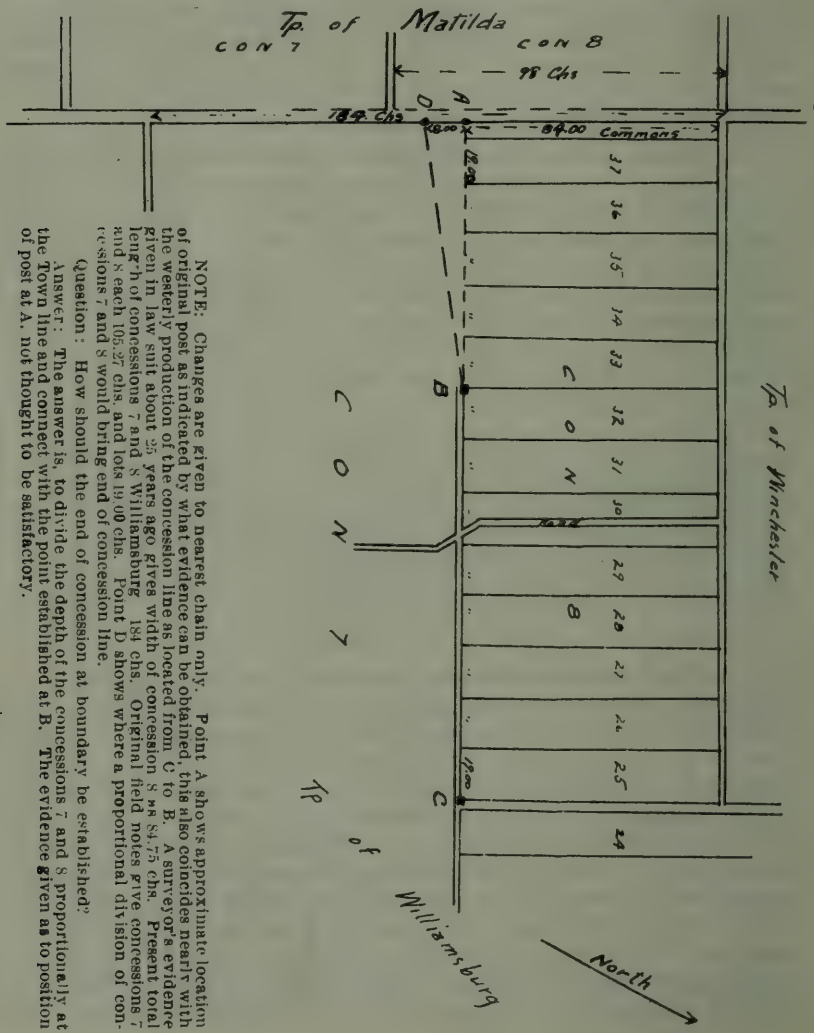
If a plan conform to all the above requirements (and it should be our business to see that it does), it would seem that the clause in the Registry Act referring to the filing of field notes with the plan is superfluous. In the opinion of many of us it is only embarrassing, as so-called "field notes" of a subdivision are practically contained in the plan. Anything else is of no use to us, and of no use to anyone else, and only make extra clerical work just to make up something to satisfy the often undiscriminating notions of the officials of the Registry Office. It would be, therefore, a real relief to have it done away with.

A very useful addition to the Registry Act proposed was that, in case a plan was filed showing it only partly staked out, but which was subsequently—say within a year—completely staked out by the surveyor, it shall be necessary for the Registrar, upon notice from the surveyor, to endorse the same on the plan. The purpose of this is to show that the posts are planted by the same surveyor and, therefore, to be considered original posts. This is really an important matter, worthy of consideration.

Another matter which was brought up at our last meeting was the case of allowances for roads, graded, travelled and fenced for a long period, but which are not on the true limits, being crooked or narrow, or where the true limits are difficult to establish, this is a case of frequent occurrence in our older townships, some laid out over a hundred years ago. Where the surveyor has to do something in which such a road is a boundary it is hard to decide what to do to keep out of trouble. An attempt to run the lines according to statute will often go off the travelled road altogether; a municipal survey for the same reason be unsatisfactory, besides the delay and expense. Would it not be well, therefore, to obtain legislative power to establish such roads as they exist by taking the centre line of the travel and laying off the half each side. There are

several special Acts in our older townships on this principle. The Municipal Act and the Statute of Limitations, R.S.O. 1910, have some bearing on the question of long occupation of government roads. This is a matter which has both a technical and legal side, and the experience of those who have had to do with it would be valuable to the Association.

C. J. MURPHY, Chairman.



NOTE: Changes are given to nearest chain only. Point A shows approximate location of original post as indicated by what evidence can be obtained, this also coincides nearly with the westerly production of the concession line as located from C to B. A surveyor's evidence given in law suit about 25 years ago gives width of concession 8 as 84.75 chs. Present total length of concessions 7 and 8 Williamsburg 184 chs. Original field notes give concessions 7 and 8 each 105.27 chs. and lots 19.00 chs. Point D shows where a proportional division of concessions 7 and 8 would bring end of concession line.

Question: How should the end of concession at boundary be established?

Answer: The answer is, to divide the depth of the concessions 7 and 8 proportionally at the Town line and connect with the point established at B. The evidence given as to position of post at A. not thought to be satisfactory.

REPORT OF COMMITTEE ON TOPOGRAPHICAL SURVEY.

The Report on Topographical Survey for the year 1912 contained a brief review of the triangulation work being carried on by the staff engaged on the geodetic survey of Canada; this report will give a brief outline of the precise levelling work which is being carried on under the same authority, limiting our remarks to the work in Ontario.

The precise levels of the Geodetic Survey of Canada in Ontario and Quebec started at a bench mark established by the United States Coast and Geodetic Survey at Rouse Point, N.Y. This bench mark is included in an elaborate net of precise levels and water transfers which are based on mean sea level at New York, and its adjusted elevation is believed to be very close to the truth.

From this bench mark two lines of levels were run, one westerly through Lacolle Junction, Coteau Junction, Prescott, Hamilton, London and Chatham, to Windsor, with a branch from Hamilton to St. Catharines and Bridgeburg; the other was run easterly through St. John to Sherbrooke and thence following the Quebec Central Railway to the St. Lawrence River at Levis.

All these lines are levelled twice—in opposite directions, called forward and backward levelling. Backward are entirely independent of the forward; the same turning points are not used. If the forward levelling is made in the forenoon, the backward over the same line is made in the afternoon when this can be done without delaying the work. If the difference of elevation as indicated by forward and backward levelling between two permanent bench marks exceeds the fraction represented by the formula $\pm 0.017\sqrt{M}$, ("M" standing for miles), the section is levelled over and repeated until the difference falls within the limit specified. This means that for the distance of one mile the forward and backward elevations must agree to within 0.017 ft., which in a distance of 4 miles would amount to 0.034 ft., and in 100 miles 0.17 ft.

Two circuits levelled in Ontario, one 436 miles in length, gave a difference in the elevation of 0.15 ft., and another, 595 miles in length, gave a difference of 0.11 ft. in closing on the bench mark started from. These differences come a long way within the limit of 0.17 ft. for 100 miles, and show what results can be obtained in the way of levelling by careful observers with good instruments.

A standard bench mark now in use to perpetuate the precise levels in Canada is a copper bolt $\frac{3}{4}$ inch in diameter and 4 inches

in length stamped on the end with the letters G.S.C. B.M. (Geodetic Survey of Canada Bench Mark). The bolt is set horizontally in masonry, a hole being drilled the exact size of the bolt, which is driven in until the end is flush with the masonry or slightly projecting. If properly put in the bolt cannot be removed without destroying the surrounding rock or masonry. After the exposed end of the bolt has been planed to a smooth surface with a file, the letters are stamped on the end with a steel die and a cross mark made with a cold chisel, from which the elevation is taken.

A paper published in the May and June number of the *Journal of the Royal Astronomical Society of Canada* for 1912, by Mr. F. B. Reid, D.L.S., a member of the Geodetic Survey Staff and Inspector of Precise Levelling, gives a very full and clear account of this branch of the work as carried on by the Geodetic Survey in different parts of Canada where the levelling parties are engaged.

A report issued from the Chief Astronomer's office and published last year gives a description of the bench marks established in the Province of Quebec, New Brunswick and in Ontario east of Colborne via Canadian Pacific Railway to Prescott and the Grand Trunk Railway from Prescott to Colborne. After the list is fully made out and published covering those roads in the settled parts of Ontario over which precise levels have been taken our Association might with great advantage to the members practising in these parts of the Province have a compiled list of all these points, with a description of the bench marks, and included in the same volume the latitude and longitude of all the trigonometrical stations occupied by the Geodetic Survey staff and the astronomical bearing of lines joining the stations.

Such a volume could be used as a companion to the Survey Act and would supply the data required for compiling an accurate map of any portion of the Province. Maps of counties made under such control would fit together in compiling a map of the Province. As they are now no one could expect them to join, surveyed as they were in the early days, when bearings were taken with the compass subject to local attraction and changes due to varying conditions of the atmosphere and distances measured with the old-fashioned chain made out of wire with several rings between the links for the purpose of regulating its length. The geographic positions of all the trigonometric stations east of Trenton were given in the report for 1912. It may be possible to give the remainder of the stations for the thickly settled portions of the Province for the annual report for 1914. Owing to the absence of the chief of the comput-

ing staff, who is spending the winter in Washington, I am not able to secure a further list of the computed positions for this year's report. A short list of the elevations above sea level, taken by the precise levelling division at railway stations on the top of the rail in front of the telegraph office, and in front of the station house or platform at flag stations, will be of value to those surveyors and engineers practising their profession in these localities. The list is as follows:

Railway.	Station.	Elev. above sea level.
Grand Trunk	Coteau Junction	160.1 ft.
" "	St. Polycarpe	176.0 "
Canadian Pacific	St. Polycarpe Junction	194.0 "
" "	St. Telesphore	213.7 "
" "	Dalhousie Mills	226.5 "
" "	Glen Norman	253.0 "
" "	Green Valley	281.5 "
" "	Apple Hill	301.5 "
" "	Monckland	330.8 "
" "	Avonmore	327.0 "
" "	Finch	274.9 "
" "	Chesterville	240.1 "
" "	Winchester	249.9 "
" "	Inkermann	267.1 "
" "	Mountain	272.5 "
" "	Kempton (Diamond Crossing)	332.8 "
" "	Oxford	354.5 "
" "	Spencerville	318.5 "
Grand Trunk	Prescott	310.9 "
" "	Maitland	329.7 "
" "	Brockville	283.6 "
" "	Lyn	283.4 "
" "	Younge Mills	302.9 "
" "	Lansdowne	337.6 "
" "	Thousand Island Junction	346.6 "
" "	Findley	368.7 "
" "	Rideau	306.2 "
" "	Kingston Junction	275.5 "
" "	Kingston & Pembroke Ry. (Diamond Crossing)	283.3 "
" "	Collins Bay	284.8 "
" "	Ernestown	325.0 "
" "	Fredericksburg	308.2 "

Railway.	Station.	Elev. above sea level.
Grand Trunk	Napanee	314.3 ft.
" "	Bay of Quinte Ry. (Diamond Crossing)	326.5 "
" "	Marysville	335.8 "
" "	Shannonville	334.8 "
" "	Belleville	286.0 "
" "	Trenton	285.3 "
" "	Brighton	303.7 "
" "	Colborne	321.8 "

Similar rail elevations have been taken to the westerly border of the province, but the results are not yet in print, and as these elevations are subject to change by the section men when renewing ties and levelling up the track, they could only be used as an approximation, in the absence of a permanent bench mark.

There are other subjects which might be considered as coming within the province of this report, one of which, viz., the conservation of the water at the sources of our streams deserves more than a passing notice, and what steps should be taken to prevent the loss which occurs every year through spring floods; the water which finds access to our streams so rapidly that floods are the result, destroying property of great value and producing nothing in return in the way of turning wheels and generating electricity.

The first step necessary to remedy such a condition would be to secure an accurate topographic map of all the streams which are a menace to property, including the entire river basin and all sources.

It could then be ascertained where dams should be constructed for the formation of reservoirs to store the water and to regulate its flow when required for power, as well as other purposes.

The Ontario Government having taken in hand the task of controlling the price of electric energy by supplying it to the community at cost, the task should commend itself to the same Commission to take such further steps as are necessary to carry out this additional work in the interest of the community. These points together with the others outlined, are respectfully submitted for future consideration.

THOMAS FAWCETT,

Chairman.

REPORT OF THE COMMITTEE ON REPOSITORY AND BIOGRAPHY.

Your Committee beg to report that it is advisable to undertake a compilation of biographies of surveyors of Canada, more especially of those previous to 1840, and a record of the work done in the field by these men. This would be of great value to surveyors in hunting up records regarding surveys previous to that time, and would also be an interesting document to have on file in our Repository.

Your Committee would also suggest that this Committee next year undertake the work of gathering together and tabulating the different books and reports in our possession with a view to having bound those which require it, and which are of interest to the Association, and destroying those which are of no value.

Short biographical sketches have been secured and are appended herewith of the following members who died during the last few years, namely: Messrs. C. F. Aylsworth, W. R. Rombough, W. A. Brown, Andrew Bell, Walter Beatty and Henry O. Wood.

Respectfully submitted,

L. V. RORKE,

Chairman.

William Rose Rombough, P.L.S.

was the eldest son of the late Nicholas and Sarah Barnhardt Rombough, United Empire Loyalists, whose home was near Napanee. He was born on June 22nd, 1822. When a young man he was a public school teacher a few years. He received his education at the Newburgh schools and in one of the Montreal colleges. He received his diploma as a land surveyor in 1848 and began the practice of his profession north of the place of his birth. He was married in the year 1857 to Miss Mary Bower of Newburgh, after which he moved to Durham, in the County of Grey, where they resided forty-three years. Mr. Rombough was employed by the Government surveying lands in the Counties of Grey and Bruce. He also did much surveying for private parties. Mr. Rombough was a tall, stalwart man, skilful in his profession; kind, obliging and popular. He was favorably known in Durham as an enterprising and good citizen. About twenty years ago he retired from active work because of serious illness. In the year 1898 he moved with his

family to Toronto, where he resided comfortably in his own home. He was a Methodist, a Liberal in politics, and probably the oldest surveyor in the country. He died on September 19th, 1912, in the ninety-first year of his age, and was buried in the family burial plot in Mount Pleasant Cemetery in Toronto.

Andrew Bell

was born on December 21st, 1835, at Toronto. His father was the Reverend William Bell, a Presbyterian minister, and his mother was the eldest daughter of the late Colonel E. W. Thomson, of Toronto. Andrew Bell was educated at Queen's University, from which he graduated with the degree of Bachelor or Arts in 1853. He obtained his commission to practise as a land surveyor on the 14th of October, 1866. Mr. Bell's practice was of a varied nature, comprising surveying, engineering and architecture. He was a member of both the American and Canadian Societies of Civil Engineers, a member of the Ontario Association of Architects, and also a Dominion Land Surveyor. He was engaged on several public engineering works in Eastern Ontario, among which were the construction of the Brockville and Ottawa Railway, the Brockville and Smith's Falls Railway, the Carillon Canal Dam, the Grenville Canal, the railway line from Sand Point to Pembroke, the construction of the Rosamond Woollen Mills and the Cornwall Woollen Mills, the court house at La Chute, the town hall at Arnprior, and the post offices at Almonte and Carleton Place. In September, 1858, Mr. Bell married Miss Rosamond, eldest daughter of James Rosamond. The last few years of his life Mr. Bell was engaged in surveying in Northern Ontario for the Ontario Government, and it was while engaged in the field during the past season that Mr. Bell contracted an illness from which he never recovered. He died at his home, "The Maples," in Almonte, on Tuesday, October 12th, 1912. Mr. Bell was a Conservative in politics, but not an extremist in any matter. He was a wide reader of books and always kept well informed on current topics. He lived a very busy life and was courteous and affable to all, either in social or business life.

William Albert Brown.

One of the best known land surveyors in Ontario passed away on July 29th, 1912, in the person of William Albert Browne, at the age of sixty-eight years. Mr. Browne was born in England in 1843 and was a son of the late J. O. Browne, who was also a surveyor, and came to Canada from England in 1849. The late Mr. Browne was educated at Upper Canada College and, after securing his

commission as a land surveyor, spent thirty-seven years of his professional life in Toronto; the remaining eight years, when a young man, were devoted to engineering and surveying in Thunder Bay District. Mr. Browne received his commission as land surveyor in 1876 and was a member of the well-known firm of Unwin, Browne & Sankey. He was a veteran of the war of 1866 and was for thirty years previous to his death connected with St. Stephen's Church, in the City of Toronto, in which he was an ardent worker, and his loss will be greatly felt in the community in general in which he was associated.

Henry Osborne Wood.

Henry Osborne Wood, O.L.S., was a descendant of one of three brothers who emigrated to America from England in early colonial times. Of the three branches of the Wood family which springs from this source, one is at present in the Eastern Townships, one in Ontario, and the other still in the United States. At the outbreak of the Revolution the ancestors of those at present in Canada espoused the royal cause and took an active part in support of the king's prerogative during the war, and being obliged in consequence abandoned their property and left their former homes in New Jersey after the recognition of American independence. His great grandfather, Jonas Wood, was a man of prominence in his old home, having been captured in arms by the continental troops, was held in durance for a length of time after the declaration of peace before being released, after which he immediately came to Canada and was one of the few who located on the present site of Cornwall, Ontario, prior to the arrival of the main column of United Empire Loyalists under Sir John Johnston.

Mr. H. O. Wood was born in Cornwall on the 30th of December, 1827. His father was Leonard Wood (grandson of Jonas Wood) and his mother Margaret Cook, a descendant of another U. E. Loyalist family, of the vicinity of Cornwall, where both were born. Mr. Wood afterwards moved from Cornwall with his father to the Township of Osgoode, and in 1853 he again moved to the Township of Gloucester, County of Carleton, where he resided up to the year 1901.

Mr. Wood's first surveying was with the late George Bruce, O.L.S., and in 1852 he signed articles as an apprentice with the late Robert Bell, O.L.S. After serving three years with Mr. Bell he received his commission as a surveyor on the 10th of October, 1855. From 1856 to 1871 he was engaged by the Ontario Government in the surveys of the Township of Brudnell, part of the Town-

ship of Alice, Township of Lyndock and the Township of Mayo. From 1871 to 1901 he was engaged in local surveying and civil engineering in the Counties of Carleton, Russell, Stormont and Glengarry.

In 1901 Mr. Wood retired from active work and moved to the city of Ottawa, where he resided up to the time of his death on the 17th day of June, 1908.

Walter Beatty.

Walter Beatty, O.L.S., was born in front of Yonge Street, County of Leeds, on the 3rd of January, 1836. He was educated at the public and grammar schools in the town of Brockville and served his apprenticeship with William Rath, at Mitchell. He obtained his commission as Provincial Land Surveyor on the 19th of July, 1858.

Considerable of Mr. Beatty's time was spent in making surveys for both the Federal and Provincial Governments. He first undertook surveys for the Federal Government in 1871 and spent many seasons on work in the Provinces of Manitoba, Saskatchewan and Alberta. Mr. Beatty also took an active part in municipal and Provincial affairs. He was for several years Deputy Reeve and Reeve of the Township of Bastard, and also Warden of the County Council. He also represented the constituency of South Leeds during three Provincial Parliaments.

Mr. Beatty died on the 5th of January, 1911, at his home at Delta, where he had resided for the past fifty years.

Charles Fraser Aylsworth.

Charles Fraser Aylsworth was born on March 5th, 1834, at Odessa, Ontario, and obtained a license to practise as surveyor in 1861. Mr. Aylsworth entered the Government service in 1863, when Quebec was the seat of government, and surveyed the Township of Carlow, in the County of Hastings. Then for two years he was engaged building colonization roads in the then newer portions of the Province of Ontario, and afterwards appointed Inspector of Colonization Roads, which position he filled until 1903, when, owing to ill health, he resigned.

Upon obtaining a license to practise as a surveyor he moved to Madoc, where he continuously resided until his death. He occupied many prominent public positions and always took a keen interest in public affairs.

Mr. Aylsworth was of United Empire Loyalist descent. His death occurred on June 27th, 1911. He is survived by three sons, a daughter and a widow.

Biography of Lindsay Russell.

1839, March 4th—Born. Father's name A. T. Russell, C.E.

1856-7—With Walter Shawley, C.E., on soundings for Georgian Bay Canal.

1858-9—With the Canadian Exploring Expedition of country between Lake Superior and Red River.

1862—Married Harriet, daughter of the late Daniel McLachlan, of Arnprior.

1866-7—In Department of Crown Lands.

1870—Assistant in charge of construction of the Red River route during the passage of the first military expedition to Fort Garry under Colonel Wolseley, specially referred to in published "Narrative."

1871, July 26th—Appointed Inspector of Surveys.

1872, Feb. 28th—Constituted a Dominion Land Surveyor by General Act of Parliament.

Appointed Assistant Surveyor-General for Canada.

Appointed Dominion Lands Agent at Fort Garry.

In connection with the Chief Astronomer of H. M. North American Boundary Commission determined.

1872—By telegraph from Chicago, the longitude of Pembina in International Boundary.

1873—Appointed Indian Treaty Commissioner with Governor Morris of Manitoba, but resigned in favor of S. T. Dawson of Dawson Route fame.

1874, Feb. 28th—Scientific survey of Northwest Territories constituted and Lindsay Russell appointed Director in charge.

1875—Appointed member of Board of Examiners of Dominion Land Surveyors.

1875, June—Severely injured leg and ankle fractured, upset from buckboard while at work in Manitoba.

1879, Jan. 25th—Appointed Surveyor-General of Canada.

1882, March 13th—Appointed Deputy Minister of the Interior on reorganization of the Department.

1883, June 7th—Owing to the very rapid extension of surveys in the Northwest Territories requiring his constant attention, he was relieved of work as Deputy Minister and confirmed as Surveyor-General, with rank and pay as Deputy Minister.

1884—Retired from public service owing to ill health and was superannuated.

1912, Sept. 9—Died at his home in Arnprior. He had no family and is survived by his widow.

Mr. Russell was a close student of languages and was remarkably proficient in the Ojibway tongue. Ever since his retirement his ruling passion has been the construction of the higher class of astronomical instruments and testing the various methods of observations, also criticisms of results. Numerous manuscript note books remain as witnesses of the assiduity with which he pursued his studies until overtaken by blindness shortly before his death. His untiring efforts to improve the efficiency and promote the interests of those who had the good fortune to serve under him earned him a host of friends, prominent among whom we might mention Dr. W. F. King, C.M.G., the able and efficient Director of the Dominion Observatory, who was associated with him during the greater part of his active operations in the Northwest.

REPORT OF THE COMMITTEE ON ENGINEERING.

In view of the fact that the Report on Engineering covers such an extensive field, your Committee beg leave to have the time extended until the Annual Meeting in 1914, when it is hoped they will be able to present a much more extensive report, covering all the different branches of Engineering, than is possible to do at its present meeting.

OWEN McKAY,

Chairman.

PAPERS

(This Association is not responsible as a body for the opinions expressed in its Papers by Authors.)

SUBDIVISION SURVEYS IN ALBERTA.

BY CLAYTON E. BUSH.

The system of subdivision in vogue in the Province of Alberta since February 16th, 1912, is best set forth by quoting a few clauses from the Albert Surveys Act.

"13. When a surveyor is employed to make a subdivision survey he shall first re-establish and carefully survey such part of the original outlines of any section, quarter section, settlement lot or other surveyed parcel of land, necessary to properly establish the boundaries of the land to be subdivided, and shall then establish the block corners on the outlines of the land to be subdivided, or if it is intended that there be no block corners on the said outlines, he shall establish those block corners adjacent thereto, and shall subsequently determine the interior block corners of his survey in reference to the block corners so first established."

"14. Every surveyor shall mark all corners and angles of blocks with iron posts having the number or letter designating the block marked thereon with a cold chisel; and straight lines connecting the said corners and angles in the manner shown on the plan shall constitute the boundaries of said blocks."

"15. Every surveyor shall mark, in all blocks which have curvilinear boundaries, the points of beginning and end of each curve having a constant radius, and shall mark all four corners of each lot on said curvilinear boundary with iron posts."

"16. The iron posts planted in accordance with the two next preceding sections shall, upon the registration of the plan of survey, establish for all purposes whatsoever the true and unalterable boundaries of every lot or block shown on such plan, whether or

not such iron posts upon admeasurement upon the ground are found to be in the relative position shown on such plan of survey."

"17. Each and every lot on a rectilinear block boundary shall have a frontage measurement proportionate to the total distance between the corners of the block in the same ratio as the frontage measurements of each lot shown in the registered plan bears to the total distance between the corners of the block shown on said plan."

"18. Every surveyor employed to survey a side or rear boundary of any lot or parcel of land as shown on a plan of subdivision survey registered after the passing of this Act, where the said line is not a block boundary, shall proceed in such a manner as to give each and every lot and lane in the block which contains the said lot dimensions proportionate to those shown on the said registered plan."

The iron posts referred to in the foregoing clauses are of regulation size, viz., tubes three feet in length and three-quarters of an inch in diameter, pointed at one end and squared and plugged at the other end, and weighing not less than two and one-half pounds each.

The intermediate lot corners are usually marked with wooden stakes for the convenience of those dealing with the land surveyed. From the Act it is important to note that these stakes marking lot corners are not legal points, and whether planted at the time of making the original survey or not, may or may not mark the true corners of such lots.

This system of survey greatly benefits the surveyor, as iron posts can be driven in winter as well as summer, and the intermediate stakes not being required for registration, enables the surveyor to practise the year around.

Regarding the re-establishment of lost corners of subdivision surveys, I will quote clause 20 of the Alberta Surveys Act.

"20. When a surveyor is employed to make a survey in any subdivision of which a plan has been registered after the passing of this Act, and is unable to find the original iron post planted at the corner of any block (or lot on a curvilinear block boundary), of which he is required to re-establish the boundaries, he shall obtain the best evidence possible of the original position of such post, and, if satisfied in regard to such evidence, re-establish the said boundaries accordingly by planting a new iron post in lieu of the lost

post; but if in his opinion such evidence is inconclusive or untrustworthy, he shall proceed as follows:

"(a) If such post is for a block corner at the intersection of two of the external boundaries of the original subdivision, or at the intersection of the inner limits of the streets adjoining such external boundaries, he shall join by a straight line the two nearest undisputed points which are block corners on each of said boundaries, or limits, and produce the two straight lines thus determined to an intersection, and shall plant an iron post in re-establishment of the lost corner at said intersection;"

"(b) If such post is for a block corner on one of the external boundaries of the subdivision, or for a block corner adjacent thereto, in cases where no block corners were established on such external boundary, as the same is shown on the registered plan thereof, he shall connect by a straight line the nearest undisputed points which are block corners on, or adjacent to, such boundary which are on opposite sides of the lost corner, and shall plant an iron post in re-establishment of the lost corner on the said line in such manner as to make the distances between it and the two undisputed points proportionate to one another in the same ratio as those shown therefore on the registered plan;"

"(c) In all other cases of lost block corners, he shall join by straight lines the two nearest undisputed points which are block corners, which are on the opposite sides of the lost corner on each of the street lines which intersect at said corner, and shall plant an iron post in re-establishment of the lost corner at the intersection of the two said straight lines;"

"(d) If such post is for a lot corner on a curvilinear block boundary, he shall re-establish said boundary as between the two nearest undisputed points thereon which are on opposite sides of the lost corner, and which are shown on the registered plan to be block corners, lot corners or points of curve, and shall re-establish the lost corner on the boundary so re-established in such a way as to make the distances between the said corner and the two undisputed points proportionate to one another in the same ratio as those shown therefor on the registered plan."

Noting section (b) of the preceding clause, the re-establishment of block corners on exterior boundaries differs from that in Ontario, in that in proportioning plan distances with the measurements found on the ground, the streets and lanes are given their portion of surplus deficiency, as well as lot frontages. Also section

(c) renders street lines straight upon the re-establishment of the lost corner.

The originality in this system of subdivision is credited to Messrs. L. C. Charlesworth, D.L.S., Director of Surveys for the Province of Alberta; and R. W. Cantley, D.L.S., Registrar to the Alberta Land Surveyors' Association.

All subdivision surveys are made to comply with the regulations of the Department of Public Works for that province, also with the regulations of any corporate city or town in which the land to be subdivided is situated. Plans in duplicate are submitted to the department, and in case the land to be subdivided is situated in any incorporated city or town, a plan is also submitted to the Council for approval.

This plan shows on it that which is required for registered plans, which includes a school site of not less than one acre, and in addition sufficient contours to indicate clearly the topographical features of the land to be subdivided.

The following clauses of the regulations of the Department affect the surveyor:

"7. Where the land proposed to be subdivided is in or near any corporate city or town the Minister may require the owner to secure the approval of the Council of such city or town, or someone deputed by them to give such approval."

"8. When the land proposed to be subdivided is adjacent to any body of water a road shall be provided along the shore of such body of water."

"9. No street shall be laid out less than sixty-six feet in width but streets of greater width shall be provided if required by the Minister."

"10. No lane shall be laid out less than twenty feet in width."

"11. Access shall be provided by lane to the rear of every lot having a frontage of sixty-five feet or less."

"12. The distance between parallel streets or streets having the same general direction shall not exceed six hundred and sixty feet."

"13. When the parcel of land to be subdivided adjoins property that has been previously subdivided, at least every alternate street as laid out in the previous subdivision shall be produced

through in the proposed subdivision; provided, however, that where the parcel of land to be subdivided lies between two parcels previously subdivided, this provision shall be so modified that a sufficient number of streets in either or both of the adjoining subdivisions shall be produced through the proposed subdivision, and the Minister shall determine what streets in either or both of the previous subdivisions shall be so produced."

"14. No strip of land shall be left unsubdivided between any subdivision and the adjacent lands owned by any other person, the leaving of which strip is obviously intended to debar the owner of such adjacent lands from having access to the streets and lanes of the subdivision."

"15. Every subdivision shall be connected by at least one street with each of the road allowances which bound the quarter section of which the subdivision forms a part."

"16. All plans of subdivision presented for approval shall be on a scale of two hundred feet to one inch."

"17. The Minister may, prior to the registration of any subdivision plan, order such changes thereon as may be deemed necessary in the public interest."

"18. The Minister may authorize the registration of any plan notwithstanding that the same does not conform with these regulations, when, in his opinion, any peculiar circumstances exist."

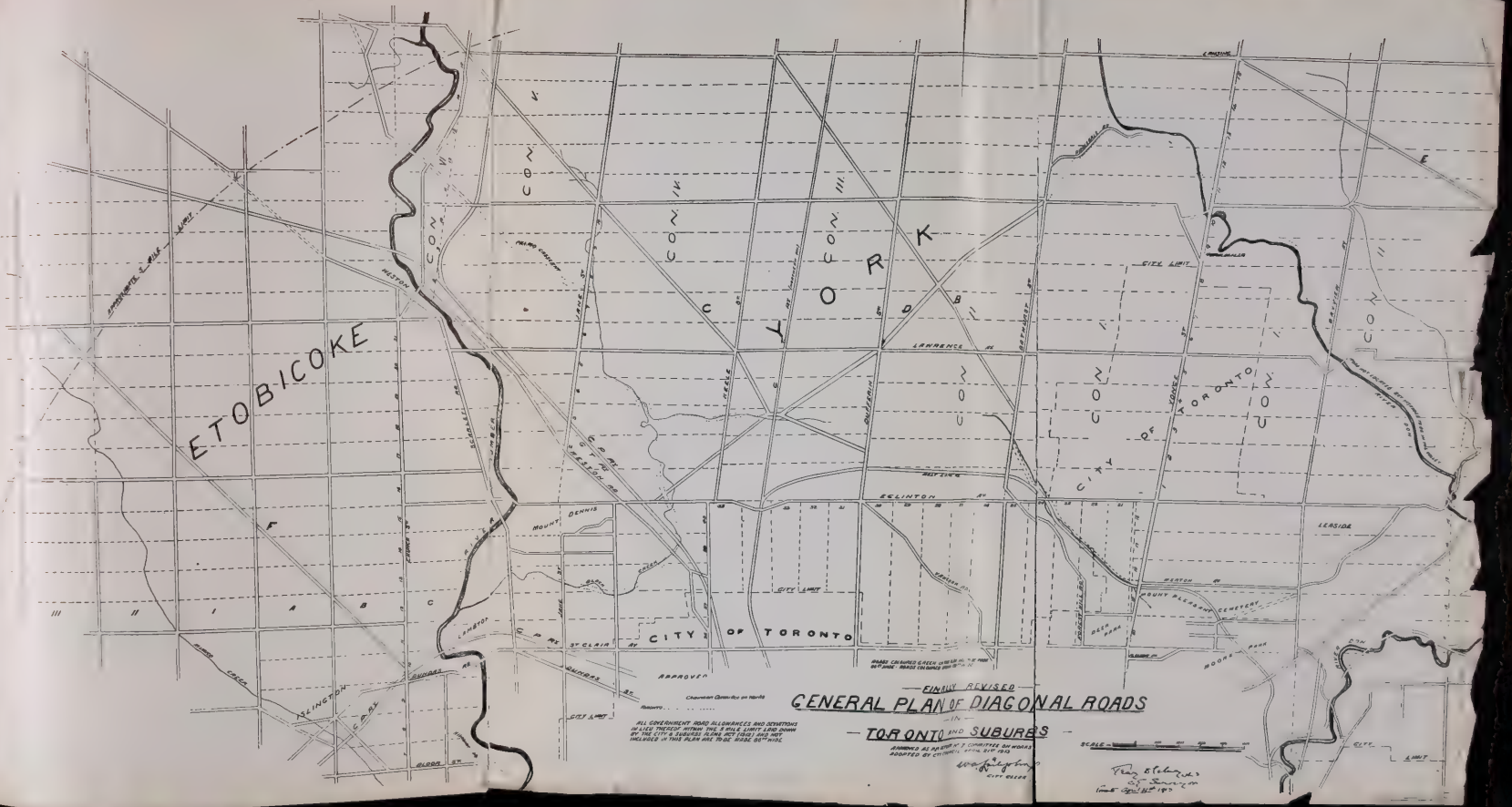
"20. The Minister may, in approving any plan for registration, limit the time for which such approval holds good and within which the plan must be registered."

In conclusion, a few words may be said regarding plans for registration on points only which differ from those of this Province.

Plans must not exceed twenty-nine inches in width, but may be any length, as they are not mounted but rolled in filing. The outlines of the land subdivided are shown in orange or red ink, and not tinted or colored. This method greatly facilitates the obtaining of any information at the Land Titles Office by the Surveyor.

Plans must show the full boundaries of the section, quarter section, river lot, or parcel of land of which the subdivision sought to be registered is a part, and must show a direct tie between the said subdivision survey and the said boundaries."

"Plans must not show any subdivision lines that are not intended to be registered at the time of presentation; plans showing certain blocks surrounded by a red line on a plan of full subdivision, of which it is only intended to register the blocks so surrounded, will not be accepted for registration."


ETOBICOKE
YORK
CITY OF TORONTO
CITY OF TORONTO
CON I
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CON V
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CON X
CON XI
LAWRENCE AV
EGLINTON AV
ST CLAIR AV
DUNDAS ST
BLOOR ST
WESTON RD
KEELE ST
DUFFERIN ST
BATHURST ST
YONGE ST
BAYVIEW AV
LESLIE ST
MOUNT DENNIS
LEASIDE
CITY LIMIT
PROPOSED DIAGONAL ROAD
EXISTING DIAGONAL ROAD
PARKS CROSSED EACH WAY BY THE 100' WIDE DIAGONAL ROADS ON THIS PLAN
ALL GOVERNMENT ROAD ALLOWANCES AND DEVIATIONS OF LESS THEREOF WITHIN THE 2 MILE LIMIT AND SHOWN BY THE CITY & SUBURBS ALONE NOT ISSUED AND NOT INCLUDED IN THIS PLAN ARE TO BE 66'0" WIDE
APPROVED
Chairman Centre Rds Com'te
Members
FINAL REVISED
GENERAL PLAN OF DIAGONAL ROADS
IN
TORONTO AND SUBURBS
ADOPTED BY COUNCIL APRIL 21ST 1913
SCALE
CITY ENGR
CITY CLERK

SCARBOROUGH
CON. II.
CON. III.
CON. IV.
CON. A
CON. B
CON. C.
CON. D
CON. E
CON. F
CON. G
CON. H
O'SULLIVAN'S CORNERS
KINGSTON RD.
G. T. RY.
ST. CLAIR AV.
DANFORTH AV.
STEELES AV.
YONGE ST.
MARKHAM RD.
MORNINGSIDE AV.
BIRCH HILLS AV.
TRAIL SIDE
HEARD
C. P. RY.
H. & E. RY.

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DIAGONAL ROADS.

BY T. D. LeMAY.

The subject of diagonal roads is one that is inseparable from the commercial or economic side of town planning; a science that in Canada seems to exist only as a hobby for various associations of architects and others, and which is far from occupying the position it should, that is one of the foremost items in municipal affairs, if not the foremost.

The word "diagonal" is apt to convey to one's mind either a picture of farms cut into pieces, or a picture of irregular lots and loss of frontage, but if for the word "diagonal" we substitute "radial," or, better still, "arterial," these objections are lost sight of. Radial roads are, perhaps, of more vital importance to Canada, and other new countries, than to the older countries of Europe, where the absence of a gridiron plan as the basis of all subdivisions of land, and the existence, instead of old travelled roads forming direct means of communication between different centres, make radial thoroughfares the rule, rather than the exception, and deprive the word "diagonal" of the significance that it has when applied to our own right-angled system. If we consider the road maps of countries which have not been laid out, but which have been developed by the requirements of the people, or the plans of cities of similar growth, it will be found in all cases that the principle underlying the position of the main thoroughfares, is that of direct communication between the centres, as far as is consistent with the topography of the district. Figures I. to IV., which are the theoretical street plans of four European capitals, illustrate this principle and the manner in which it has actually applied.

We have a country laid out in rectangles of various sizes, the side lines of which form the basis of our street system and which are projected rigidly in some cases across miles of lake and marsh and up impossible grades. We have property boundaries paralleling our original road allowances, and our new streets paralleling our property boundaries, whether they run east and west, or north and south. The result is chaos, with, as its consequence, an incalculable waste of time and money, just because two sides of a triangle are greater than the third. The case for diagonal roads is one that can almost be summed up in the words "direct communication" with this added feature, that, while streets in a grid-

iron plan are only fed by streets running at right angles to them, a diagonal street is fed by streets running both north and south and east and west, and on that account, if constructed as an aid to rapid transit in the heart of a city, should be of a sufficient width

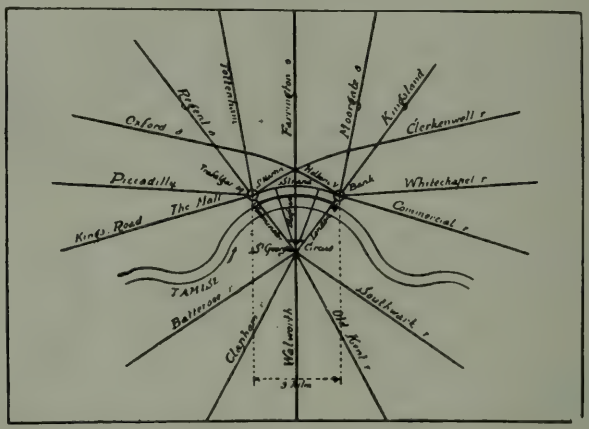


Plate I.—London.

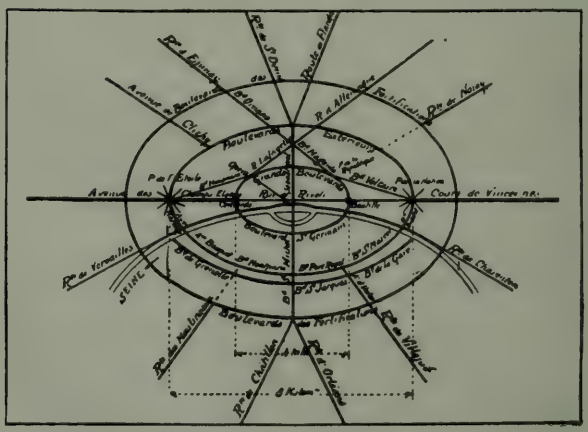


Plate II.—Paris.

to allow for three lines of traffic in each direction, one standing, one slow, and one fast, between the car-line and the curb. The most important results to be desired from the construction of such streets are the permanent location of the business centres, with the

guarantee that, in the future, there will be no depreciation of property values such as took place in Toronto when the business moved west from the market, and the provision of suitable sites for the display of those architectural features, to the absence of

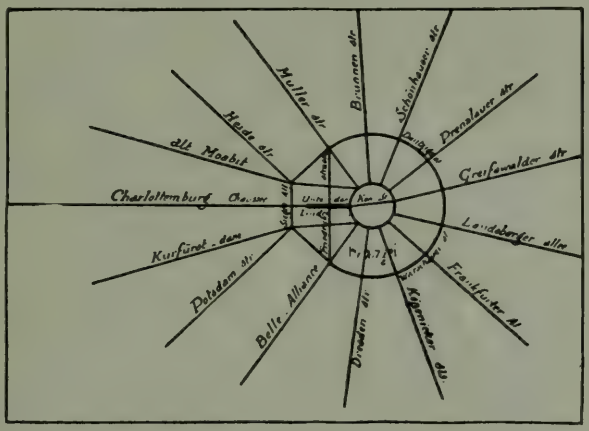


Plate III.—Berlin.

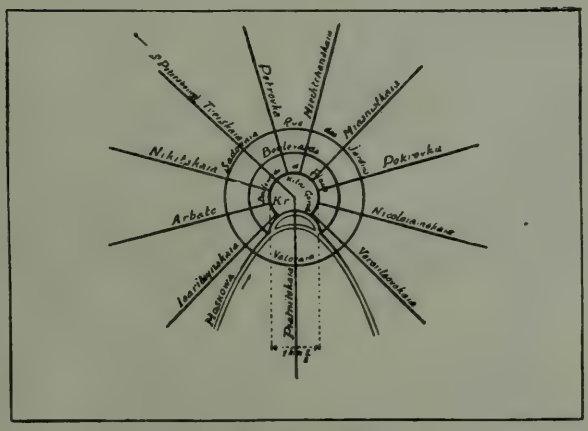


Plate IV.—Vienna.

which the lack of interest in most American and Canadian cities may be attributed. On the other hand, we have to contend with the plea of loss of frontage, severance of property, and irregularity of lots, which are, of course, uncontrovertible, but which should

not be a barrier to the improvement of conditions for the general good. In the United States of America, the construction of diagonal roads has been accepted, in many instances, as the solution.

Plate IV.—Washington, showing gridiron street plan overlaid by diagonals, as planned by Washington and L'Enfant.

Washington (Fig. V.), a city built from the plan of the French engineer l'Enfant and General Washington in 1791, shows an elaborate system of diagonals, superimposed on the gridiron plan,

and Washington to-day is generally recognized as the most beautiful and convenient city in America, and one of the most beautiful capitals in the world. Philadelphia has commenced the construction of a system of four diagonals leading from the City Hall Square. The plan of improvements for Chicago (Fig. VI.), prepared at an enormous cost, shows a complete system of diagonals superimposed on the gridiron plan. In London, direct communication has recently been obtained between Holborn and the Strand,

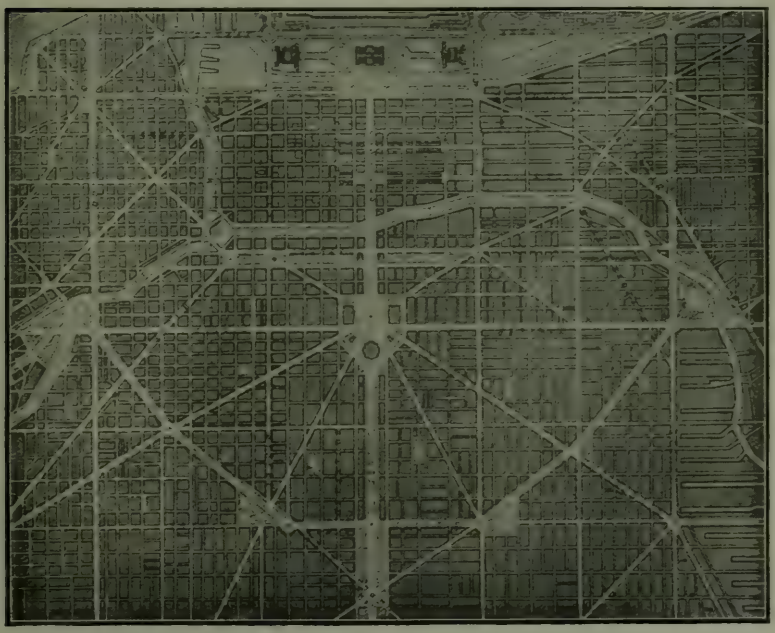


Plate VI.—Business portion of Chicago showing diagonal streets proposed by Plan Commission.

at a cost of about $30,000,000; this is, of course, not the net cost, but is useful as illustrating the magnitude of the work, which, in all probability, would never have been necessary had Sir Christopher Wren's great plan of a remodelled London been adopted after the great fire in 1666. Similarly, money will, without a doubt, be spent on similar projects throughout the cities of Canada, if the matter is not taken hold of in time, and provision made now for the needs of future generations, which, I submit, we are bound to

do if we admit our duty to posterity and appreciate the future of our country. The first step in the right direction was taken in this Province last year, when the provisions of the "City and Suburbs Plans Act" placed in the hands of the governing bodies of cities of 50,000 population or over power to adopt individual schemes of town-planning covering lands within five miles of the city limits.

In Toronto, under this authority, about 60 miles of diagonal roads were laid down last year by survey, and marked on the ground by stone monuments at every intersecting lot line. (See map.) It may be years, of course, before the roads are open from end to end, but when that does come to pass they should prove of inestimable value in dealing with traffic problems. But does not this Act seem something like locking the stable door after the horse is stolen, for, by the time a city is big enough to have a population of 50,000 the damage has been done. It is the small towns and villages of to-day that will be the big cities of the future, when the population of Canada is no longer eight, but eighty millions, and the present is the time when steps should be taken to shape their growth, so that the future cities of this country may benefit as far as possible from the experience of the world and may not be a reproach to the present generation of surveyors and a lasting monument to their lack of foresight. I would advocate legislation enabling the smallest municipality to adopt and carry out its own town planning schemes, whilst it should be for the provincial authorities to aid in the laying out of direct roads between neighboring towns, until the whole country was a network of trunk roads providing the best possible means of communication between all centres, and each town had its plan of future development, with its main arteries projected into the suburbs, and its boulevards, parks and open spaces provided for. This, perhaps, in view of the very decided feelings of the majority of property owners, is in the nature of a dream never to be fulfilled. The Canadian landowner, in fact, all English-speaking landowners, cannot be persuaded to make their own rights subservient to the general good. In Germany and France it is different, and it is to Germany and France we must look for the best results of scientific town planning, where the power of the municipality is unassailable, and the rights of the owners begin where the requirements for the general betterment of the community leave off. The method generally adopted is the pooling of all the land in a certain district, the projection of roads, and then the redistribution of the land in the new blocks thus formed amongst the original owners, less a percentage for new roads. In Northern Ontario work of great value is now being carried out by the opening up of trunk roads paralleling the rail-

ways and joining up such centres of population as have already manifested themselves in these comparatively unsettled regions. Therein, perhaps, lies the chief difficulty in laying down any particular scheme for a new district. It is the uncertainty as to where these centres will be located, but yet it should be possible in the original survey of any block of townships to lay down such roadways as will give direct access to railways, navigable streams, and other points of assured or probable importance to the district. In conclusion, I feel that even with our present system, or, rather, lack of system, more could be done than is by land surveyors when laying out property for subdivision in the vicinity of a town to secure continuity of streets. Frontage is, of course, important, but it is not everything, and the enhanced value on a direct thoroughfare leading to the centre of the city should reconcile even the owner to the loss of a little frontage if the matter was presented to him in the right light, and one cannot but feel that in laying down such a road on a subdivision plan something more has been done than merely the provision of a means to sell certain building lots, but that a step has been taken towards bringing some outlying district into more direct communication with the business centre, and that another part of the municipality has taken its final shape for better or for worse.

Discussion.

The President—We have been very fortunate indeed in having two such excellent papers this morning, and this paper is now open for discussion. We would be glad to hear from any of the members.

Mr. Russell—I would like to ask Mr. Le May how he would start this thing? Would it not be a good plan to have it arranged so that the Railway Commission or something of that kind should have submitted to them any subdivisions existing a quarter of a mile square.

The President—All the plans are submitted to the Ontario Railway Board in Toronto. That only provides for cities of 50,000 and over.

Mr. Le May—I would suggest legislation should be obtained whereby the smallest place should be able to adopt and make permanent its own town planning scheme; that they should be able to draw up a plan and file it at the City Hall, and that should govern all future subdivisions of land in the neighborhood. The

Railway Board might be required to give their approval, or some higher authority than the Village Council should give their approval; but once it is laid out, all subdividers must conform to the streets as laid out on that plan.

Mr. Kirkpatrick—I am sure we have all been very much interested in Mr. Le May's paper. I would move that it be inserted in the minutes, and we are very much obliged to him indeed for it.

Mr. Russell—I second that. I think it would be a capital plan to have a copy of this paper sent to the Railway Commission, and members of the Government, who are going to be responsible in the future for the conduct of affairs of that kind, and bring to their immediate attention those things, because the progress of Ontario is going on very rapidly.

In the matter of Surveyors, I have often mentioned how much better it would be in the public interest to run roads in certain directions, but unfortunately the almighty dollar seems to be the governing factor.

The President put a motion, which, on a vote having been taken, was declared carried.

(This Association is not responsible as a body for the opinions expressed in its Papers by Authors.)

CONCRETE ROADS AND PAVEMENTS IN ONTARIO.

BY W. A. M'LEAN, CHIEF ENGINEER OF HIGHWAYS FOR ONTARIO.

The use of cement-concrete as a surface material for roads and streets is steadily increasing throughout the Province. No paving material can, to the civil engineer of safely conservative judgment, be fully accepted as of standard merit until its durability has been determined over a period sufficient to indicate its qualities under varying conditions of actual service. What that length of time is cannot be definitely stated, except in relation to the anticipated service and life of each material; but in general, fifteen or twenty years is necessary to finally fix the place and merits of a paving material, and to give safe information as to detail of construction and maintenance.

The extended use of cement-concrete in sidewalks has supplied a large amount of information leading to its successful use as a paving material, but no concrete pavement laid in Ontario under proper conditions has yet been down the full term of its life, nor has practice in construction yet passed entirely beyond the experimental stage. Various problems remain to be solved, and improvements will in all probability be effected, through experiment and experience.

The principal objections to concrete as a material for roads and pavements have been that the surface is too hard to give a proper foot-hold for horses; that it is rigid, and therefore hard on the feet of horses; that it reflects heat and has an unpleasant glare; that it is brittle; that expansion joints chip at the angles, and under constant traffic deepen to holes; that cracks have so far been unavoidable, are difficult to repair, and, like expansion joints, chip at the corners.

On the other hand, it has been recognized that were these difficulties overcome wholly or in part, concrete has certain merits. It is low in first cost, as compared with other high-class pavements, and is one of the cheapest materials yet available for a permanent pavement or road way.

Among the questions which the future will more fully determine will be the relative values of washed gravel, pit gravel, and broken stone; the relative values of one-course, and two-course roadways; the most satisfactory spacing and treatment of joints; the prevention of cracks; the production of a tougher and less brittle concrete; the surface treatment to afford a better foothold for horses.

Among the concrete pavements in Ontario with which the writer has been most familiar have been those at Windsor, Brantford, Chatham and Toronto. The town of Dunnville this year paved the main street with concrete, while sections are laid in Woodstock, Peterborough and Port Arthur. In Toronto and Hamilton, concrete has been used for a number of years for paving lanes, while Toronto has used it also between street car tracks, with satisfactory results, on King Street.

The first concrete pavements to be laid in Ontario were in Windsor in 1906, on Chatham and Church streets; and there are now about twelve miles laid in the city. These are all two-course pavements. The specifications for 1912 provided for a 4½-inch base of 1 : 2 : 4 concrete and a 1½-inch surface of 1 : 2 concrete, using washed sand and gravel from the River St. Clair. In the older pavements there has been considerable longitudinal cracking, but joints and cracks have been satisfactorily filled and protected by filling with tar, which is spread to a width of about four inches over the surface. The experiment is being made at Windsor this year by the City Engineer of using meshed fence-wiring between the top and bottom courses, and of placing longitudinal joints next the curb, both reinforcement and joint being with a view to preventing longitudinal cracks.

The City of Brantford has a private driveway, laid in 1900, which has been subjected to heavy traffic, with very satisfactory results. A block was laid in 1910 on a short residential street. This is a 1 : 6 mixture of cement and pit gravel, 6 inches in thickness. Transverse joints were made every 30 feet. Longitudinal cracks have developed. In 1911 another block was laid, a one-course pavement of 1 : 5 mixture, using crushed gravel and sand, and the thickness is 5 inches. Longitudinal joints were left in the centre of a portion of the roadway; but as yet no longitudinal cracks have occurred at any point. Another short section was laid in 1912, a two-course pavement, 6 inches thick. The bottom course is a 1 : 4 mixture, 4½ inches thick, and the surface 1½ inches is made of 1 : 1½ mortar, using clean sharp sand. As this pavement was laid on a grade varying from 5 to 8 per cent., transverse

corrugations were made in the surface four inches apart, to improve the foothold for horses.

The County of York, in 1912, laid a concrete roadway on the Lake Shore Road, two miles in length. This is a one-course pavement, of 1 : 2½ : 4 concrete, using pit gravel and broken limestone; and is seven inches thick. Transverse joints are made at 50-foot intervals, and the pavement was given a paint-coat of bitumen, followed by a light covering of finely crushed granite. Other pavements of similar design were laid on private property adjacent to Toronto.

For experimental purposes a concrete roadway was, in 1912, laid by the Ontario Office of Public Highways adjacent to Windsor, where desirable material was obtainable, and results could be obtained in close comparison with concrete pavements laid by the city. This is on Tecumseh Road, a leading entrance to the city, and the westerly terminus of the old trunk road between Windsor and Montreal. The concrete roadway is sixteen feet wide and seven inches thick, with broken stone shoulders one foot wide on each side, and blind stone drains from the bottom of the stone shoulders to the open gutters. Tile drains were laid on one side only, as the other side was served by a deep open ditch. The material used was clean river gravel, using a 1 : 4 mixture; and a section of fairly clean pit gravel, of similar proportions. A section will this year (1913) be treated with a bituminous paint coat.

A leading feature of the experimental road at Windsor is the use of hydrated lime in a section 800 feet in length. Experiments have in the past indicated that the expansion of concrete is as great through varying conditions of moisture as through change in temperature. Hydrated lime is recognized as one of the most efficient means of water-proofing concrete, making it denser, less permeable and less porous. It was the belief of the writer that the principle might effectively be adapted to pavements, and that a concrete rendered waterproof by this means would be improved in several ways. It is anticipated that a tougher material will result; that the action of frost on the dryer concrete will be less disruptive; and that the movement of the concrete, through expansion and contraction, and causing longitudinal cracks, may in part, be overcome. A similar object was sought by the well-known experiments of the United States Office of Public Roads in the construction of concrete pavements containing a proportion of oil. The hydrated-lime used at Windsor was manufactured at

the Prison Farm, Guelph, 8 per cent. in volume of the Portland cement being replaced by it in the mixture.

From the foregoing brief outline of experience and experiment with concrete pavements in Ontario, it is evident that active steps are being taken to overcome its recognized deficiencies, to determine the best methods of construction, and to define the class of traffic to which it is adapted. At the present time practice favors one-course construction, rich in cement, coupled with careful drainage of the sub-soil. Two-course design will no doubt lessen the cost in certain cases, where suitable surface aggregate is expensive as compared with local material available for a lower course. Narrow transverse joints are sought; and to prevent chipping under traffic they may be filled and painted with asphalt or tar, protected with a proprietory form of soft steel plate, or made by folding tar paper over a steel form and removing the latter when the concrete has set.

A loose stone on a macadam roadway crushes more readily than when rolled into the crust and firmly supported on all sides by other stones. Similarly, stones embedded in Portland cement mortar are reinforced on all sides, so that wear becomes almost solely a matter of abrasion rather than of crushing. Stone is thus utilized to best advantage for wear, provided that concrete is found to be serviceable in other respects. Its low cost, evident durability, and cleanliness render it an apparently useful pavement for small towns and villages, and for country roads subjected to heavy automobile, motor truck and teaming traffic at all seasons of the year. Should the concrete surface last for a term of ten or fifteen years, it should still be in excellent condition to receive a bituminous surface—a contingency which should be provided for in fixing the design and elevations, particularly the relative height of curb, on town streets. While concrete may be expected to prove a valuable addition to the materials for road surfacing, there is no prospect that it will materially displace any of the other standard pavements, but rather that it will supplement them in a field not hitherto provided for.

Discussion.

The Secretary—Mr. President: That is a very interesting paper we have listened to, and I would move that the paper be accepted and printed in our report, and that a vote of thanks be tendered Mr. McLean for his excellent paper. I am sure he has spent a good deal of time upon it just now when he is very busy

with the Good Roads Convention, and I think his efforts ought to be appreciated.

Mr. Russell—I would be very glad to second this resolution. It is a very important matter. A question of the different forms of roads is one of importance, and I wish very much we had there some mention of the estimate of the cost of these various systems that have been adopted. It would be immensely valuable. Before the paper is put in the minutes, I think it would be a good plan to suggest to Mr. McLean the inclusion of some data of that nature. I have great pleasure in seconding the resolution.

Mr. T. H. Jones (Brantford)—Mr. President: As to the question of cost, perhaps I might be allowed to say a word. Mr. McLean, in his paper referred to Brantford, where we have had a little experience in concrete pavements. There was one interesting item to which he referred, and that was a private roadway, laid in 1890, was in good condition to-day. It was a little more than an ordinary private roadway; it was only about twelve feet in width, but it happened to be a private roadway in connection with a wholesale manufactory, where they have very heavy teaming. That roadway has had a test of 23 years, and it is practically in as good condition to-day as when laid.

Brantford, I think, was the first city in Ontario to take up as a municipal work the construction of concrete walks, beginning in 1890, and about 70 miles of those have been laid; but, as Mr. McLean stated, it was only in 1910 the first pavement was laid. He referred to longitudinal cracks in that pavement. That is true, but it is also fair to state that the pavement was laid very late in the year, and a heavy frost occurred while it was being laid. The pavement laid the following year on Chestnut Avenue, in Brantford, which is about 520 feet in length, and about 26 feet in width, shows no longitudinal cracks whatever. That pavement is in very good condition except where the transverse joints were left, a little chipping is occurring. In the Wayne County road, adjacent to the Detroit, they are using steel plates along the edge, which they claim have been used very successfully now for about three years. To show we have faith in our town in concrete pavements, the pavement to which Mr. McLean referred to as being on a very steep grade, is laid at the intersection of two of the heaviest traffic streets in the city, and while it was laid only last year, and has come through only one winter, it is showing good results.

In reference to the cost of pavements, I might say those on residential streets ran from 80 to 85 cents a square yard, and that the more expensive ones on business streets came to $1.30. In ref-

erence to the other pavements, on which the city has laid concrete foundations: They are five or six inches in depth; there are of these pavements about seventy or eighty thousand square yards, and by doing that by local labor they save about 25 cents per square yard; but the thought has occurred that in a pavement of which the full thickness is some seven or eight inches, and of which six inches is concrete—that concrete costing about fifty cents a square yard and the other costing from $1.30 to $1.63, which is what we have been paying for two inches—whether by making the whole concrete, a great saving would not be made. As a matter of fact, our more extensive concrete pavement was $1.30; the others laid by the city cost from $1.60 to $2.30 per square yard. I myself have great faith in these pavements, and I believe they are the coming pavements, especially in residential streets, and, more than that, I think they will be very largely used for business streets. Mr. McLean referred to one of the objections, that is a glare of light on one of the streets on which it is laid. I happened to be living on one of those streets, and it was the purpose there to color the pavements dark to do away with that, but the residents on the street objected strongly to it. We think it is the brightest and most cheerful pavement in the town. We like the light appearance of the concrete amongst the grass and green trees. It is so light you can see at night. As regards slipperiness, I have questioned several of the teamsters there, and I find some of them say it is less slippery than the other pavements. As regards being hard on horses' feet, as long as they have the easy traction, a little more for shoeing horses is not a very large item.

The President—We are glad to have had the paper read, although Mr. McLean was not here, and had it not been for that we would not have had this very lucid explanation by Mr. Jones, the Engineer of Brantford. He has answered the question Mr. Russell had reference to.

Mr. Russell—Very satisfactorily. I am very glad to hear it.

The President put the motion, which, on a vote having been taken, was declared carried.

(This Association is not responsible as a body for the opinions expressed in its papers by Authors.)

THE BOUNDARY SURVEY BETWEEN CANADA AND THE UNITED STATES EAST OF THE ST. LAWRENCE RIVER.

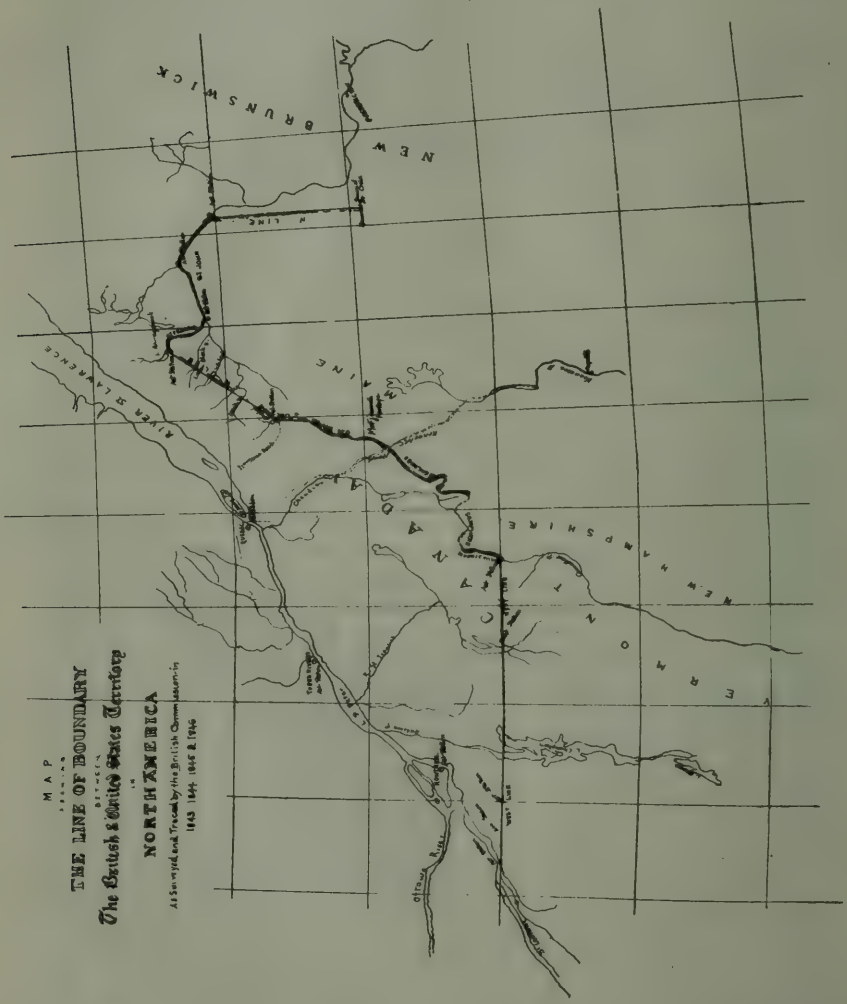
BY THOS. FAWCETT.

Under terms of a treaty between Her Majesty the Queen of the United Kingdom of Great Britain and Ireland, signed at Washington, August 19th, 1842, by the Right Honourable Alexander Lord Ashburton for Her Britannic Majesty, and Daniel Webster, Secretary of State, for the United States.

Article 1, which covers that part of the boundary considered in this paper, reads as follows:

"It is hereby agreed and declared that the line of boundary shall be as follows: Beginning at the monument at the source of the River St. Croix, as designated and agreed to by the Commissioners under the Fifth Article of the Treaty, 1749, between the Governments of Great Britain and the United States; thence north, following the exploring line run and marked by the surveyors of the two Governments in the years 1817 and 1818, under the Fifth Article of the Treaty of Ghent, to its intersection with the River St. John, and to the middle of the channel thereof; thence up the middle of the main channel of the said River St. John to the mouth of the River St. Francis; thence up the middle of the channel of the said River St. Francis and of the lakes through which it flows, to the outlet of the Lake Pohenagamook; thence southwesterly in a straight line to a point on the north-west branch of the River St. John, which point shall be ten miles distant from the main branch of the St. John in a straight line and in the nearest direction; but if the said point shall be found to be less than seven miles from the nearest point of the summit or crest of the highlands that divide those rivers which empty themselves into the St. Lawrence from those which fall into the River St. John, then the said point shall be made to recede down the said north-west branch of the River St. John to a point seven miles in a straight line from the

said summit or crest; thence in a straight line in a course about south eight degrees west to the point where the parallel of latitude 46° 25′ north, intersects the south-west branch of the St. John;



thence southerly by the said branch to the source thereof in the highlands at Metjarmette Portage; thence down along the said highlands which divide the waters which empty themselves into the

St. Lawrence from those which fall into the Atlantic Ocean, to the head of Hall's Stream; thence down the middle of said stream till the line intersects the old line of boundary surveyed and marked by Valentine and Collins previous to the year 1774 as the 45th degree of north latitude, and which has been known and understood to be the line of actual division between the State of New York and Vermont on one side and the British Province of Canada on the other; and from said point of intersection west along the said dividing line, as heretofore known and understood, to the Iroquois or St. Lawrence River."

Article No. 6 of the same treaty made provision for carrying the terms of the treaty into effect by appointing two Commissioners, one by Her Britannic Majesty and one by the President of the United States and the Senate thereof. A section of the Article reads as follows:

"The said Commissioners shall meet at Bangor, in the State of Maine, on the 1st of May next, or as soon thereafter as may be, and shall proceed to mark the line above described from the source of the St. Croix to the River St. John, and shall trace on proper maps the dividing lines along said river and along the River St. Francis to the outlet of Lake Pohenagamook; and from the outlet of the said lake, they shall ascertain, fix, and mark by proper and durable monuments on the land the line described in the first Article of this treaty; and the said Commissioners shall make to each of their respective Governments a joint report or declaration under their hands and seals, designating such line of boundary, and shall accompany such report or declaration with maps, certified by them to be true maps of the new boundary."

The Commissioners appointed by the two countries were Lieut.-Col. J. S. Buchnal Estcourt, on behalf of Her Britannic Majesty, and Mr. Albert Smith for the United States. With a view to carrying out the necessary astronomical work which such a survey demanded, on behalf of Her Majesty's Government, the Earl of Aberdeen—then Secretary of State for the Foreign Department—applied to Professor Airy, F.R.S., the Astronomer-Royal, requesting him to recommend two practical astronomers accustomed to the use of first-class instruments, since it would be necessary to determine with accuracy the latitudes and longitudes of several points for the purpose of determining the positions denoted in the treaty. After studying the wording of the treaty, Prof. Airy submitted several questions to the Foreign Office in reference to the wording of certain clauses which he considered required a more definite meaning before he would be prepared to lay out any scheme for

the astronomical work. The questions by Mr. Airy, and replies thereto given by Mr. H. M. Addington, Secretary to the Foreign Office, are as follows. The questions refer to the wording of certain sections of the Treaty.

QUESTION 1—

"Thence north, following the exploratory line run and marked by the surveyors, etc. Is this line to be traced truly north, even though it diverge from that of the former surveyor; or is any respect whatever to be paid to the line of the former surveyors?"

ANSWER—

"The line of the former surveyors is intended to be adhered to; consequently the term 'north' does not mean truly north, but in a northerly direction."

QUESTION II—

"Thence southerly in a straight line to a point on the north-west branch of the St. John, which point shall be ten miles distant from the main branch of the St. John. Is the line to be traced truly south-west? The point upon the north-west branch of the St. John is a strictly definite point, and may not be hit by a south-westerly line. And does the expression '10 miles' denote 10 miles at the least?"

ANSWER—

"The term 'ten miles' denotes ten miles at least, according to the English view of the Treaty; consequently the term *south-west* must be taken as meaning not truly south-west, but in a south-westerly direction."

QUESTION III—(Last line but two.)—

"And from said point of intersection west along the said dividing line, as heretofore known and understood. The doubt is the same as in question No. 1. If the new line diverge from the old understood line, which is to be adopted?"

ANSWER—

"The old line is to be adhered to; consequently the term 'west' must be taken as meaning in a westerly direction."

After receiving those answers, Prof. Airy compiled a table containing a summary of such observations as he thought would conform with the requirement as set forth in the several answers to the questions submitted.

Section of Boundary Line.	*Observations Required.*
1. From Mars Hill, near the source of the St. Croix River, to the River St. John.	None. The line already traced to be followed.
2. Up the channel of St. John River and of the St. Francis, to Lake Pohenagamook.	None.
3. In a straight line to a point on the branch of the St. John 10 miles distant from the main branch.	None.
4. Thence to the point where the parallel of 46° 25′ latitude intersects the St. John River.	One latitude to be determined.
5. Thence up the stream along the watershed, and down Hall's stream to the old line of boundary in 45° N. latitude.	None.
6. Thence along the line marked by Valentine and Collins to the Iroquois or St. Lawrence River.	None. The line already run to be followed.

This memorandum, which was sent to Mr. Addington at the Foreign Office, was forwarded to Col. Mudge, R. E., one of the officers directing the Ordnance Survey of Great Britain, and who, some years previous, had been in America as a Commissioner connected with the same boundary. Col. Mudge had made out a programme of what he considered would be necessary in the way of astronomical work on different sections of the boundary, which was handed to Professor Airy. In referring to that section of the boundary from the source of the St. Croix River to the St. John, Col. Mudge says: "This exploring line, although supposed to be straight (a good approximation) was not intended to be final. It is only marked by blazing the trees at certain distances, and felling such trees as came in the way." "Although the greater part is now filled up with trees, shrubs and fallen timber, which must be cleared away again." "I should think that the line, as explored and agreed on in Lord Ashburton's Treaty, may be sufficiently made out so as to admit, supposing a good intention to exist on both sides, of the Commissioners fixing certain points at

equal distances between the marked trees, which being connected by a straight line, will form the boundary line from the monument to the River St. John."

"From this due north line to the next point mentioned in the Treaty, it is manifest that the terms of the Treaty cannot be complied with. It is there stated that points or marks in the centre of the bed of the River St. John, such to be the boundary marks to the second lake on the River St. Francis. Now, this is altogether impracticable, if the marks are intended to be at all durable. The melting of the ice in the spring would sweep away anything built on or driven into the bed of the river. The only way to carry out the intention of the Treaty will be to let the banks form the boundary, with an equal right to navigation to both parties. This, I conclude," says Col. Mudge, "will be finally arranged through Lord Ashburton, with the American authorities."

The boundary line would then be determined from the monument by the "due north" line to the River St. John, and from thence up to the south end of the second lake on the River St. Francis, a tributary of the St. John. The straight S. W. line from Lake Pohenagamook to the N. W. branch of the River St. John—a line nearly 70 miles in length, through a dense forest, which was to be drawn straight, so as to connect two fixed points, was a proposition which presented great difficulty and promised to be exceedingly laborious. This was a condition where Col. Mudge recognized accurate astronomical observations to determine the latitude and longitude at each of the points to be connected by a straight line, the difference of latitude and longitude of the two points to be connected would be required to compute the bearing of a line that would join them.

The astronomical observations which Col. Mudge recommended for the purpose of establishing the boundary were the following points, at which he recommended latitude and longitude determinations would be advisable:

1st. The monument at the source of the St. Croix commencement of the north line.

2nd. At the termination of the north line touching the St. John River.

3rd. The southern end of Lake Pohenagamook, on the St. Francis River.

4th. The point on the N.W. branch of the River St. John to be established 10 miles distant from the main branch in a straight line.

5th. The point on the S.W. branch of the St. John intersected by the parallel of 46° 25′ south eight degrees west from the point before named on the N.W. branch.

6th. The source of the S.W. branch in the highlands and at as many other points as convenience and time of observers would admit.

For the purpose of ascertaining the difference of longitude between Lake Pohenagamook and the north-west branch of the St. John River, intermediate astronomical stations were established at the mouth of the St. Francis, on the St. John River, at the rapids about half-way to the N.W. branch and at the junction of the Daquamme or Metaquamme with the St.John. The astronomers, Capt. Robinson and Lieut. Pipon, Royal Engineers, occupied the stations at each terminus, and chronometers were sent back and forward in charge of members of the Engineering Corps, by canoe in summer and sleighs drawn by horses after the river froze over, repeating the journeys and comparing the time at the two points, also checking results by moon culminations and lunar distances, until the officers were satisfied they had a very close approximation to the difference of longitude between Lake Pohenagamook and the astronomical station at the junction of the Daquamme with the St. John. From that point a line had been cut out and measured to the point selected under the Treaty on the N.W. branch, and, with this distance and the bearing of the line, the difference of latitude and longitude was computed, and the data for determining the bearing of the *south-west* line complete.

The officers then took a trip out to Quebec. This was in the month of January, and a road had been opened to Quebec to haul provisions in to the north-west branch. While there they had an opportunity to complete their computations, and get everything in readiness to run the south-west line with large parties working from both ends.

Col. Estcourt and Capt. Robinson, with a large corps of sappers and miners and laborers, returned to the north-west branch the first of March, and Lieut. Pipon, with a smaller part, proceeded to Lake Pohenagamook. Both parties began work about the 1st of March. The account given of this work in a letter from Capt. Robinson, written to Professor Airy, will convey a very clear idea as to the *modus operandi.* The letter says, in part:

"I have the pleasure of informing you that we have completed the running of the line from the outlet of Lake Pohenagamook to this point. The measured distance is 64½ miles—agreeing closely with the computed one—and the *error* of the course, or the distance between the ends of our two lines on the ridge where we met each other was 341 feet.

"I feel sure we should have been nearer than this but for the circumstance of many of our observations having been made during the winter, which was a severe one." Capt. Estcourt has expressed himself as highly satisfied, but of course we cannot venture to take any credit to ourselves until we have your opinion. Trigonometrically done, an error of 341 feet in a side would be very great, but astronomically, I hope it will pass creditably." "As soon as we had laid off the direction of the line, and had cut some four miles, we came to the high ground, the line passing over the shoulder of Sugar Loaf Hill. From a point on this we commanded a good view over the country up to 35½ miles on the line, and by raising a platform we saw the 42½-mile point. We pitched our tents on Sugar Loaf Hill, set up the transit, and directed the setting of points in the line up to the time of meeting Mr. Pipon from the opposite end." "Our mode of proceeding was as follows: At the N.W. branch I used the altitude and azimuth instrument as a transit, setting up a meridian mark, and at the same time I used the transit for getting the correct time. The altazimuth instrument stood 35 feet east of the transit, the axis being carefully levelled, and when a circumpolar star crossed the centre wire, it was also intersected by the altazimuth instrument, and a meridian mark afterwards fixed under it. This was tried and re-tried with the instrument reversed. The angle was then laid off by the altazimuth instrument, and a lamp on Sugar Loaf Hill was lined in by signal and fixed under the centre wire. The transit was then moved up to the point, and a good firm stand made for its reception. Every evening a large lantern with powerful burner and reflector was set up on the station where the altazimuth instrument had been placed as a back sight, and which had been decided to be the boundary deflection point on the north-west branch. The transit instrument was set and levelled and centred on this light; the telescope was then turned over in the direction of the line towards the next ridge or prominent point; the cutting party having made their way through the woods during the day to the point, burnt a torch, which was easily moved to the exact spot under the centre wire by flashing gunpowder. The signals were thus: One flash—Are you ready? Which was answered by a flash was an affirmative. Then we had one flash, move east; two flashes, move west;

three, wait a while; four, all right, go home. Each signal was answered by a corresponding number of flashes from the other party. The flashes were made at first with a quantity equal to two charges of a fowling-piece, then three charges, and at the last or greatest distance four charges. With these charges every flash could be distinctly seen, and the party could be moved almost as easily as by speaking to them. Rockets were tried for a while, but many of them were never seen, and when seen were not as good as the gunpowder. The torches were made of birch bark saturated with turpentine, and rosin, and were distinctly visible at the greatest distance, the 42½-mile point. When the sun shone a heliostat was used for lining in. When this was visible through the last opening in the woods crossing a ridge, the men could ascertain the position of the line on the ridge ahead and get the point near enough to be ready for the night signals. For the first six or seven miles the line was opened out as the work proceeded, intended to be straight; but this was too slow, and was never sufficiently correct when within sight of the directing transit, so that system was abandoned, and the party directed to go ahead from ridge to ridge as best they could with compass bearings, and on the top of each hill, where the torch had been lined in, good stout poles, with boards nailed across, were set up as guiding points between which the sappers' theodolites could direct the cutting, the whole of the line to be cut out 30 feet wide, eight feet of which was to be cleared to the ground, similarly to the north line from St. Croix to the St. John River. Mr. Pipon and I saw nothing of each other's movements until, near the place of meeting, my party, when making their way up a long hill about three miles from the top, saw trees falling and an opening being made on the ridge, apparently right in the direction they were going. To intimate to us at Sugar Loaf Hill they had seen something satisfactory, the party on their return had an illumination with torches, and danced a hornpipe, which we could see the crossing and dodging about of the lights.

In determining the points on continuation of our respective lines, it was found that my line was 341 feet to the north-west of the other. In correcting for this error, we considered our lines to be running parallel to each other, and divided the distance 341 feet in the proportion of 42½ to 22—the distance made by each. After two flagpoles had been erected on two ridges, the cutting parties turned their backs on each other and returned to their respective posts, altering their former marks on the several ridges proportionately to the whole error and their distance. This completed, the small transit was sent through the whole way from

Lake Pohenagamook to the north-west branch, working from point to point and correcting the discrepancies, so that we were pretty sure of its being straight from end to end.

This part of the line having presented the greater difficulty in its determination, I have taken the account—somewhat abridged—verbatim from Capt. Robinson's letter reporting the survey to Prof. Airy, R.A. Professor Airy had nothing but the highest praise for this work, which he declared to exceed in accuracy anything that he had expected, and the astronomers were given great praise for their skill in achieving such satisfactory results from such data as was available to them.

In the appointment of astronomers for this work, the Foreign Office applied directly to Prof. Airy, the Astronomer Royal, offering a salary of £600 per annum, which would be equivalent to not less than $10,000 or $12,000 if rated at its purchasing value then in comparison with the present time. This, of course, was an inducement for good men to accept the position if offered them.

Prof. Airy turned his attention to the Royal Engineers, who were conducting the Ordnance Survey of Great Britain, for men who had practical experience in the use of instruments of the first class, and who had been inured to camp life, as these would be better adapted for the work than young men connected with the observatories. So he wrote Col. Colby, the Superintendent of the Ordnance Survey, and that officer recommended Capt. Robinson and Lieut. Pipon to be well adapted for the work, if the regulations under which they served as Royal Engineers could be relaxed so as to permit of their absence from England and employment on the International Boundary Survey. Through the representations of the Earl of Aberdeen, Secretary of State, Viscount Canning of the Foreign Office, and others, the appointments were made; also a number of others belonging to the Corps of Royal Engineers were appointed to assist by taking charge of parties on the work, and maintaining discipline. Prof. Airy had the two astronomers at the Royal Observatory, Greenwich, acquiring practice and skill in such astronomical work as they had to undertake on the boundary, for some months before the expedition set out. J. D. Graham, Topographical Engineer of the Coast and Geodetic Survey, was the Astronomer for the United States, and also directed the operations of the American parties in the field. He was a very capable and painstaking observer, and was said to be the first field astronomer to determine the latitude by observing the difference of the meridional zenith distances of two stars on opposite sides of the zenith, a system still considered

among the most reliable, and used in the Coast and Geodetic Survey of the United States almost exclusively. In determining the difference of longitude between points on the 45th parallel, the British and American astronomers worked together. A mountain was chosen which could be seen from both directions by observers stationed from 40 to 60 miles apart, and parties were sent equipped with powder, rockets and everything necessary to produce flashlights at certain intervals of time prearranged, which could be observed simultaneously by the observers at the stations for which the difference of longitude was wanted. The results from this method proved very satisfactory.

The renewal of the boundary question arose at the time the Alaska problem was under consideration. The Treaty which arose out of that dispute not only made provision for the delimitation of the Alaska boundary, which had not previously been run, but for the renewal and permanent demarcation of the lines formerly run from the Atlantic to the Pacific. For the purpose of carrying out this scheme, His Britannic Majesty appointed Dr. W. F. King, C.M.G., Dominion Astronomer, the Commissioner on behalf of the British Empire, and the United States appointed Mr. O. H. Tittmann, Superintendent of the Coast and Geodetic Survey, Commissioner in behalf of the United States. This work has been in progress at different points for several years, carried out by officers under instructions from the Commissioners, the American and Canadian parties often working harmoniously together. The section east of the St. Lawrence forms one of the links in this great chain. The old lines are retraced and opened out to a width of about 30 feet, or as wide as necessary for the purpose of having a clear sky-line. Along the centre of the line the brush is cleared away, and such logs as would interfere with accurate measurements cut out. The lines are measured with great care where a system of triangulation cannot be carried along as a means of control in determining accurate measurements. The tapes used are *invar*, which have been compared with the most reliable standards. The line is prepared for measurement by driving hubs from four to six inches in diameter, and rising from 3 to 4 feet above the surface of the ground, for supports for the ends of the tape. Each hub is braced by three or four braces, which are driven into the ground at an angle and nailed to the centre hub near the top, which hold it firmly in place. The hubs are set at an exact tape length, and a strip of copper or zinc about half an inch wide and two inches in length nailed on top in the direction of the line for the purpose of marking the ends of the tape. An additional support is set for the centre of the tape, when one more than 100 feet in

length is used. This may consist of a stake driven in line with the end hubs, and a nail driven in at the proper elevation for supporting the tape at the centre. When measuring, the tape is usually handled by four men. Thermometers are attached about one-fourth the length of the tape from each end, and read by the men who attend to the marking. Two men carry levers which they connect with the rear end of the tape with a chord, and at the front end to a spring balance, which is attached to that end of the tape to measure the pull or stress. The tapes are usually adjusted so as to give the proper length at a temperature of 62° F. and a tension of 15 kilogrammes (about 33 lbs.). While the marker at the rear end of the tape regulates the distance until the mark at the end coincides exactly with the mark on the copper strip, the marker at the front, with a sharp brad, marks that end as soon as the balance shows the proper tension and the signal "all right" is given by the other marker. Both thermometers are then read and noted and the tape carried forward to the next hub, where the process is repeated until half a mile, or sometimes a mile, has been measured in one direction; then the same process is followed measuring back—the measurements being made in both directions.

In returning, it sometimes becomes necessary to set back or forward an inch or so on the hubs that the marks at the end of the tape may always be on the zinc or copper strip. A scale of parts is carried for measuring these small distances, which are entered in the notes as set back or forward, as the case may be.

For the purpose of deducing the horizontal distance, the difference in the elevation of each hub is taken with a spirit level; then the corrections are for slope, for temperature and for distance set back or forward. Levels are also taken on cross-section lines run out for half a mile on each side of the main line, as often as may be found necessary to secure data to place 20-foot contours accurately on the maps.

The line is permanently marked by carefully preserving the positions of the old monuments by means of a framework which is erected over the spot, and a nail so placed that when a plumb line is attached the plummet will hang exactly over the centre of the monument. A hole is then excavated to a depth of four feet and three feet square, unless the solid rock is met with to prevent excavating to that depth. A base consisting of rocks, gravel, sand and cement in proper proportions is prepared, and the iron post, after being filled with cement, is replaced and carefully plumbed so that the centre is replaced as it stood originally. When the weather is favorable for cement work not more than six sacks

(about 550 lbs.) are required for each monument, but in the fall, when it begins to freeze and the cement sets slowly, two or three sacks additional are used. When, owing to high hills or ridges, the monuments found on the ground are not intervisible, monuments consisting of cement, about 12 inches square, and terminating in a point, are used. These monuments are first cast in a frame and are reinforced with four iron rods, one near each corner. These monuments are so set that they rise about ten inches above the base, or altogether about two feet above the ground. The base of all monuments is in the form of a pyramid rising about six inches from the four sides to the centre. These monuments are so placed that they are intervisible, and at some points several monuments can be seen with a telescope in both directions.

Where the boundary is defined by the centre of a stream, a system of triangulation has been carried along, using the quadrilateral system, where distances are determined by two independent means, and also the latitudes and departures, and level lines are run for the purpose of determining the elevations above sea level and marking the contours on the maps. For the purpose of carrying this triangulation along streams through the woods, lines had to be opened out for both the sides and diagonal of the figures, so as to measure all the angles; and additional bases measured with great care at frequent intervals. At the intersections of lines, hubs, similar to those described above for chaining were set and braced so as to be immovable, and a small flag set on top for sighting when measuring angles. When the distances did not exceed 1,000 feet in length, a small white peg set in the top of the hub, or a four-inch nail painted white would usually be sufficient. Reference monuments numbered and constructed the same as those cement monuments on the straight lines, were set on both sides of the river at distances such that they will always be intervisible when the woods are cleared away and the points require to be used in defining positions on the boundary. The geographical positions, viz., latitudes and longitudes, also interbearings of all these measurements, are computed, and by means of a table to be compiled, points on the boundary, as laid down on the charts compiled by the former commissions can be determined.

Along the north line from St. Croix, and along the St. John River, where the country is more or less cleared, the plane table was used in determining the topography, and very good charts showing the locations of all the houses, fences, roads, railroads, etc., in addition to the contour lines, were made.

The same condition, but to a lesser degree, held along the St. Francis River. The character of the country from Lake Pohen-

agamook to Hall's stream, is very much the same as it was seventy years ago. In the United States the northerly part of the State of Maine belongs to private companies, who preserve it as an unbroken forest for the production of lumber and timber, and they cut over different parts by rotation, taking only such timber as is mature. Adjoining the line in Quebec, settlement is excluded the greater part of the distance. At a few points, as at Lake Pohenagamook, St. Pamphile, the Kennebec Road, and probably two or three others east of Hall's stream, a road has been made to the boundary and settled, but by far the greater portion is inaccessible from any settlement, and the timber under limit which does not call for any speedy removal—so the wilderness remains. That part of Canada is subject to quite a heavy precipitation. During winter the snow usually falls to a depth of from three to four feet, covering the ground from November until the month of May, and the summer months are usually noted for abundance of rain, so the forest fires do not make such headway in denuding the forests here that they do in many other parts of Canada, where moisture is absent and the precipitation less. The owners of the land in the United States keep bush rangers or fire guardians, who travel the country over, and are on the lookout for any fires which may be accidentally started by lightning or otherwise, and to extinguish them, or secure such assistance as may be available to keep the fire from spreading, so that in many parts of the country there are no evidences of it being overrun by fire since the line was run out seventy years ago.

(This Association is not responsible as a body for the opinions expressed in its Papers by Authors.)

ALIQUOT PARTS OF BROKEN LOTS.

BY J. S. DOBIE.

The above subject was suggested by a survey which came up in my practice, and which involved so many unusual features that I considered that a short write-up of this survey and the subsequent decisions of the courts, to which the matter was finally referred, would be of interest to the members of the Ontario Land Surveyors' Association.

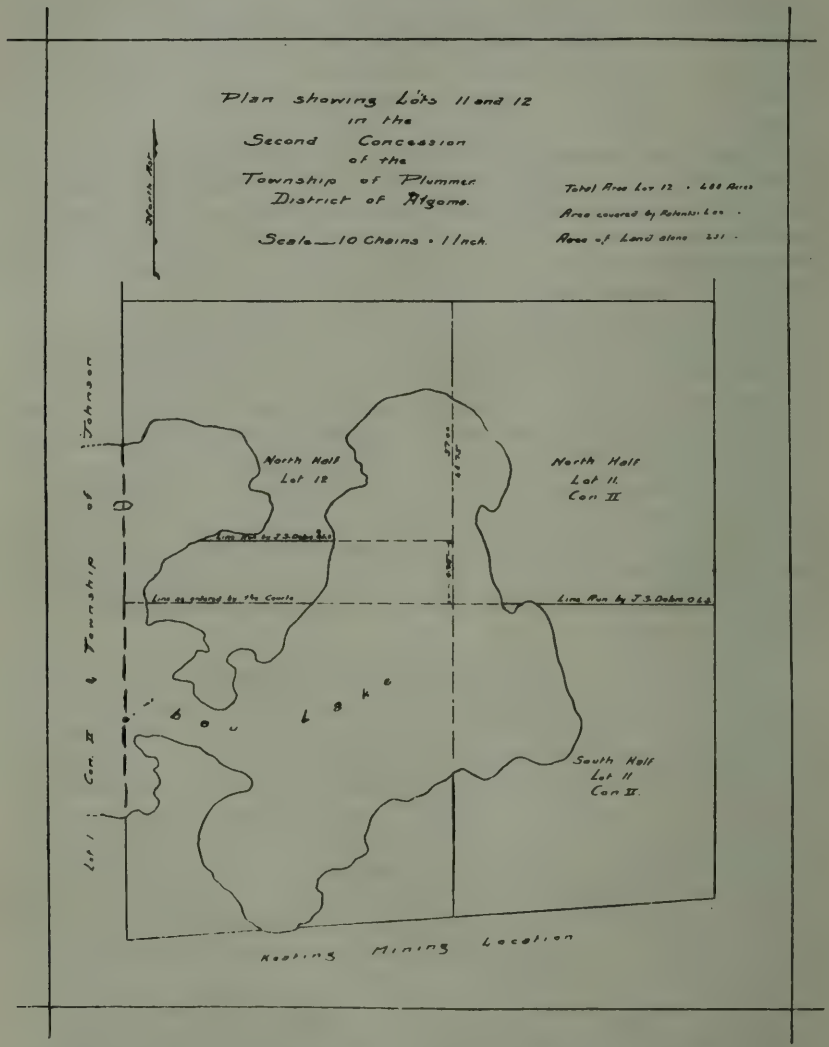
The lot in question is Lot No. 12, in the Second Concession of the Township of Plummer, in the District of Algoma.

The Townships of Plummer and Plummer Additional were surveyed by P. L. S. Quentin Johnstone in 1874, under instructions dated May 26th, 1873. The Township of Johnson, which adjoins the Township of Plummer on the west, was surveyed, together with the Township of Tarbutt, by P. L. S. Elihu Stewart in 1877, under instructions dated May 30th, 1877. The west boundary of the Township of Plummer was run about the year 1857 by P. L. S. Salter as Range Line 126 miles west of the principal meridian.

Caribou Lake, a small body of water about 1¾ miles long, is included partly in Lots 11 and 12, in the second concession of the Township of Plummer, and in Lots 1 and 2, in the second concession of the Township of Johnson. Mr. Salter, in his field notes, shows this lake in its proper position, but does not show it on his plan. Instead of the lake, two creeks are shown on the plan, crossing the line at the points where the field notes show the line to intersect the north and south shores of the lake respectively. Mr. Johnstone apparently did not see this lake, as the plan of the Township of Plummer does not show the lake at all. Mr. Stewart, however, shows the lake on his plan of the Township of Johnson.

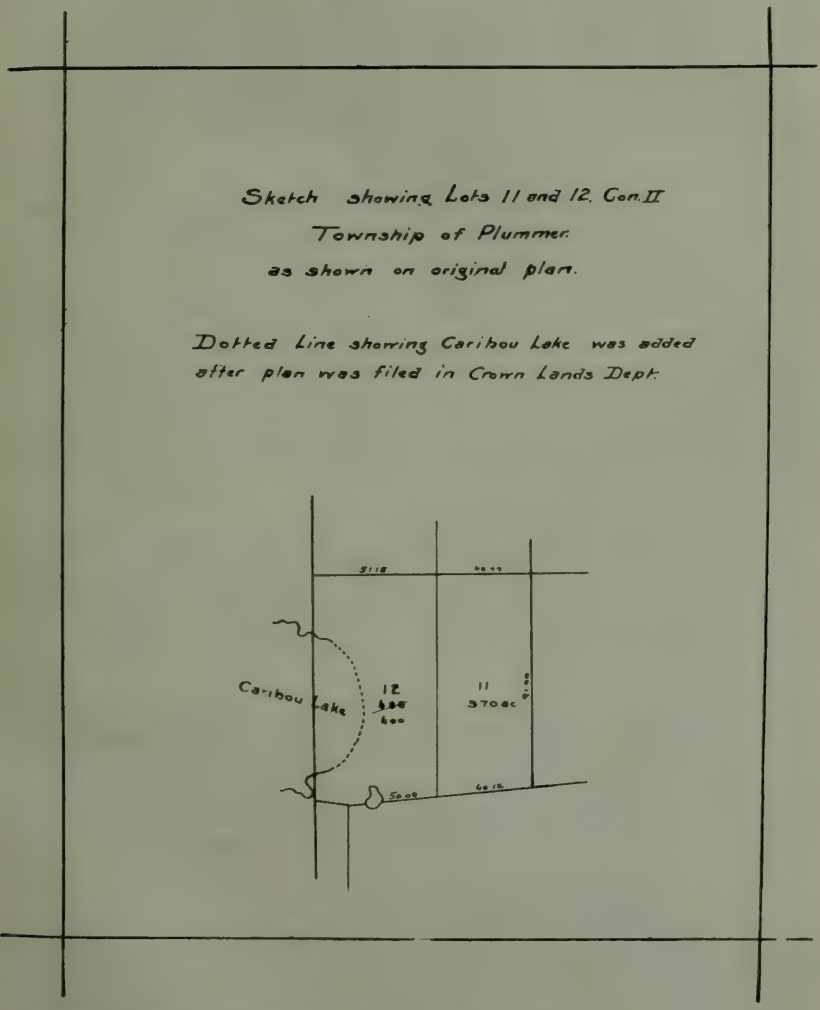
On June 9th, 1874, a return of the areas in the Township of Plummer was made by the Surveys Branch to the Sales Branch, and Lot 12, Con. II, was returned as 488 acres, the area shown on Mr. Johnstone's plan of the Township of Plummer. As soon as the returns of the survey of the Township of Johnson were

received it was discovered that Caribou Lake extended into Lot 12 in the second concession of the Township of Plummer, and the area of the broken lot, No. 12, was assumed to be 400 acres, in-



stead of 488 acres; and on March 16th, 1878, a return of areas in the Township of Johnson was made to the Sales Branch, and the return of areas in the Township of Plummer was amended, making

Lot 12, Con. II, 400 acres, more or less. The original plan of the Township of Plummer was altered by making a dotted line through Lot 12, Con. II, to indicate where the unsurveyed portion of


Sketch showing Lots 11 and 12, Con. II
Township of Plummer
as shown on original plan.
Dotted Line showing Caribou Lake was added
after plan was filed in Crown Lands Dept.
Caribou Lake
12
11
370 ac

Caribou Lake was supposed to be. The acreage was also changed from 488 to 400 acres. A lithograph bearing date March 22nd, 1878, shows Caribou Lake in this manner, as shown on Fig. 1, but gives no area.

John Williams was located for the north half of Lot 12, in the second concession of Plummer, on September 16th, 1876. On December 8th, 1881, a ruling was made for the patent to issue under the Free Grants Act. James W. Salter, Jr., was located for the south half of Lot 12, in the second concession, Plummer, on June 22nd, 1880, and a ruling was made on July 26th, 1887, for a patent to issue under the Act of 1880. On both rulings there is an entry as follows: "Caribou Lake runs into this lot; call the north half and the south half 200 acres, more or less, each."

On February 11th, 1882, John F. Day, Crown Land Agent, wrote to the Department on behalf of John Williams, stating that Caribou Lake ran into the north half of Lot 12, Con. II, and also into the south half.

On March 8th, 1882, the Director of Surveys made a memorandum on Mr. Day's letter as follows: "The original plan of Plummer does not show a lake on Lot 12, Con. II, but the plan of Johnson, adjoining it on the west, shows Caribou Lake as extending into the above lot. The lot was returned as containing 488 acres, but I think 88 acres may be put down as in Caribou Lake, and the north half and south half of said lot may be granted as 200 acres each, more or less."

On the 24th of March, 1882, a patent issued to John Williams for the north half of the lot, containing 200 acres, more or less, and on the 2nd of August, 1887, a patent issued for the south half of the lot, containing 200 acres, more or less, to James W. Salter, Jr.

I have given the full history of this lot, in order to show conclusively that it was the intention of the Department to reserve the land under the waters of that part of Caribou Lake which extended into Lot 12, notwithstanding the fact that the original survey of the township did not show the lake, and that the exact area of the lake was not known at the time the patents were issued.

In January, 1908, I was requested by Mr. Salter, the owner of the south half of Lot 12, Con. II, Plummer, to run the dividing line between the north and south halves of this lot. I proceeded to measure up the lot in the usual manner, and at once discovered that the plan was incorrect, as far as Caribou Lake was concerned. I made a traverse of the lake, and found that it extended across Lot 12, and into Lot 11, as shown on Fig. II. A small pond, shown on the original plan as crossing the south boundary of the

lot, was found to be a part of Caribou Lake, and the land on Lot 12 was divided into three parts by the lake.

I concluded that as the acreage on both the patents and the plans in the Department showed that a reservation of 88 acres had been made for water, that the purport of the patents was to convey the land exclusive of water, and I ran the dividing line accordingly, giving to each party one-half of the land, exclusive of water, as shown on Fig. II.

As regards Lot 11, there was no reservation for water whatever. The Department was ignorant of the fact that water existed on this lot, and the acreage, as shown on the original plan, was the total area of the lot, including both land and water. I therefore ran the dividing line in this case across the middle of the lot, as shown on Fig. II, giving to each of the parties half of the total area, land and water included.

On completing the survey, I took the matter up with Mr. Kirkpatrick, O. L. S., Director of Surveys, informing him of what I had done, and asked his opinion in the matter. Mr. Kirkpatrick endorsed my method of making the survey in the case of Lot 11, as well as Lot 12.

Now, the portion of Lot 12 lying between the line run by me and the line line across the middle of the lot contained some very valuable timber, and when the owner of the south half of the lot attempted to remove this timber, the owner of the north half objected, and the matter finally came up before His Honour Judge Stone, of the Algoma District Court, in April, 1912.

The facts as stated above were not questioned; the correctness of the survey was admitted, as far as the actual measurements were concerned. Mr. Kirkpatrick, O.L.S., was called as a witness, and the greater part of the historical facts in the above narrative are taken from a memorandum submitted by him, and admitted by His Honour Judge Stone as evidence.

In the meantime an Act entitled "The Bed of Navigable Waters Act" was passed by the Ontario Legislature, and was assented to on March 24th, 1911. Section 2 of this Act reads as follows: "Where land bordering on a navigable body of water, or stream has been heretofore, or shall hereafter, be granted by the Crown, it shall be presumed, in the absence of an express grant of it, that the bed of such body of water or stream was not intended to pass to the grantee of the land, and the grant shall be construed accordingly, and not in accordance with the rules of the English Common Law."

One of the points which the court had to consider was as to the application of this statute to the present case. The following is an extract from the judgment of His Honour Judge Stone, and clearly shows the view which he took of the matter.

"The question is one of construction of the plaintiff's Crown grant. Whatever opinion the surveyors may have had as to the intention of the department as to broken or unbroken lots, the real meaning of the grant is a matter of construction.

"Defendant Salter relies upon the retroactive nature of the recent statute, 1 Geo. V., ch. 6, sec. 2 (The Bed of Navigable Waters Act, quoted above). The question, therefore, arises, is Caribou Lake navigable water within the meaning of this statute? The small streams which run into Caribou Lake (as counsel agree) are only capable of floating pulpwood at time of freshet; the small streams which constitute the outlet of the lake can, by artificially constructed slides, be utilized for running logs. These cannot be considered navigable streams, Whelan v. McLachlan (1865), 16 U.C.C.P., 102. This leaves us then with a small isolated body of water 1¾ mile long, with varying width and depth. Its width where it crosses Lot 12 being all comprised within said lot, and its depth being said to be possibly 40 feet in the deepest spots.

"Throughout the cases in which navigability of rivers is discussed are found such expressions as 'public highways by water, for the ease and commodity of the people,' 'public and subservient to public accommodation,' 'broad and deep channel calculated for the purposes of commerce.' I have been able to find no English nor Canadian case in which the question of a small isolated lake such as the one in question has been considered. It is hard to conclude, however, that such expressions as I have quoted above have an application to such bodies of water as Caribou Lake. I find an American case, to the report of which I have not access, Hodges v. Williams, 95 N. C., 331, which is stated to have held that an isolated lake, although large, is not navigable. Suppose Caribou Lake were only half its size, and were comprized wholly within the limits of lot No. 12, would it be reasonable to hold that it was navigable water?

"I am of the opinion that Caribou Lake is not navigable water, and that, therefore, 1 Geo. V., ch. 6, has no application. The water being not navigable, the language of A. Wilson, J., in Ross v. Portsmouth (1866), 17 U.C.C.P. 195, is very apt in relation to the present case, where he says: "The grant of land will carry land covered with water, and there is nothing here from

which the jury or the court could infer that the parcel of land so covered, if it were not navigable, was not intended to pass by the grant, merely because it was covered with water." It was in measurement a part of this Lot 12, and the presumption is that it did pass, and was intended to pass unless the contrary is made to appear. If, then, the land covered by water was included in the grants to the patentees of the respective halves of the lot in question, to adopt the Dobie line would give to Defendant Salter one-half of the land and more than one-half of the land covered by water.

"The grants of the land covered by water conveyed to the patentees of the respective halves of the lot in question, certain exclusive rights of fishing and fowling in the waters covering the lands so granted. Beatty v. David (1891), 20 O.R., 373. In re Provincial Fisheries (1895), 26 S.C.R., 444, considering the rocky character of some portions of the land in question, it may well be doubted whether the actual value of such portions is equal to the value of equal areas in the land covered by water. The division of lot No. 12 by the Dobie line is not, in my opinion, an equitable division of the property. I am of the opinion that the proper division line between the respective halves of lot No. 12 is located midway between the north and south boundaries of the lot.

"Counsel for the Defendant, Salter, invokes 1 Geo. V., ch. 42, sec. 18 (formerly R.S.O. 1897, ch. 181, sec. 19). I do not read the word aliquot in that section as being intended to differentiate land and land covered by water, but think that its application to the present case gives to each party one-half of the superficial area of the lot (including land covered by water), notwithstanding that the area of each half quite substantially exceeds the 200 acres mentioned in the Crown grants.

"Plaintiff, therefore, will have declaration that he is owner of the strip of land in dispute, as aforesaid, and of the timber thereon, and defendants are restrained from trespassing in any way thereon."

Defendant Salter appealed against this decision of His Honour Judge Stone, and the appeal was heard in the Divisional Court at Toronto by Hon. Sir Glenholme Falconbridge, C.J.K.B., Hon. Mr. Justice Britton, and Hon. Mr. Justice Riddell, on the 20th of September, 1912.

Their Lordships held that they could not consider any intention on the part of Mr. Kirkpatrick, one of the subordinate officers of the Government, no matter how clearly shown; that they had to

construe the patents as they appeared, and that the patents gave to each party the north half and south half of the lot respectively, without reference to water or land, and that each party, therefore, took exactly one-half the total area of the whole lot, and the line must be drawn across the middle of the lot, and the parties were entitled to the waters of the lake. They found also that the lake itself could not be described as navigable within the meaning of Sec. 2 of Chap. 6, I. Geo. V., there being no navigable outlet or inlet, and the lake not constituting any part of the common highway.

This decision is one of very great interest to Ontario Land Surveyors, from the fact that it has always been the practice of the various members of the profession to divide these broken lots by excluding the water and dividing the land equally, where a patent has issued for half of a lot, and where there is no description by metes and bounds in the patent. Surveyors making original surveys of townships are instructed to survey any waters within the limits of the township, and to reserve the land under the water when calculating the areas of the adjoining lots. The areas shown on broken lots are those obtained in this manner, and the areas given in the patents are taken from the township plans, as prepared by the surveyors.

Surveyors have always considered that Section 18 of the "Surveys Act" applied to such cases; that the expression "aliquot parts" refers to the land alone, as distinguished from land covered by water. It has been said that the Surveys Act makes no mention of such a thing as a "broken lot"; Sec. 31, sub-sec. 32, which is a recent amendment to the Surveys Act, sets forth how an "unbroken lot" is to be divided, and this sub-section is the one referred to by the clause "except as hereinafter provided," which occurs in Sec. 18. The Surveys Act, therefore, now presupposes "broken lots," and it is not unreasonable to assume that by implication they are to be divided as provided in Sec. 18.

The question as to whether the water is navigable or not has never been considered, as far as I am aware, and in fact "The Bed of Navigable Waters Act" was not passed until March 24th, 1911, about three years after this survey was made.

Under these court decisions broken lots partially covered by water which is not navigable are to be divided by running a line in a manner to that provided in Sec. 31, sub-sec. 2, of the Surveys Act, where the land conveyed by the patent is described simply as a half lot, with no qualifying description by metes and bounds. The

courts hold that by implication, where land borders on an unnavigable body of water or stream, it shall be presumed that the bed of such body of water or stream was intended to pass to the grantee of the land.

Now let us consider the effect of these decisions. There is hardly a township in Ontario which does not contain at least one case of a broken lot which has been divided into halves according to the method of survey which has been condemned by these decisions. This, to the best of my knowledge, has been the universal practice of surveyors throughout the Province. These surveys are all illegal, and can be upset under these decisions.

How is the surveyor to distinguish between water that is navigable and water that is not? His Honor Judge Stone, in a recent conversation on this matter, said that he had very great difficulty in finding any precedents bearing on the question as to what waters are navigable and what are not, a fact which he mentions in his judgment. If this lake, $1\frac{3}{4}$ miles long and 40 feet deep, is not navigable, is a similar lake $2\frac{3}{4}$ miles long to be considered navigable? Suppose that the defendant in this case had a small steamer on this lake, would it be considered navigable? There are numerous lakes throughout this Province which are navigated by motor boats, but which could hardly be considered navigable under this judgment, since they have "no navigable inlet or outlet, and do not constitute part of the common highway."

It has happened more than once in recent years that the land under the waters of small lakes in certain mining divisions has been reserved from staking as mining claims by Order-in-Council. In the case of surveyed townships, where patents have issued for half lots, without descriptions by metes and bounds, these lakes are covered by the patents of the adjoining lands; and submerged lands which have already passed from the Crown under this decision might be reserved by Order-in-Council and disposed of to other parties.

Unless some legislation can be obtained to define these points clearly it will be impossible for a surveyor to divide a broken lot into aliquot parts, unless there is a description by metes and bounds. The practice of the Department in recent years has been to insert such a description in patents of broken lots, but there are numerous patents in existence for parts of broken lots where the land is described simply as half of the lot, containing so many acres, more or less.

DISCUSSION.

The President—I am sure we are very much indebted to Mr. Dobie for this very interesting paper. It is now open for discussion.

Mr. Dobie—That would cover any possible case, it seems to me, where waters, navigable or unnavigable, are matters of record in the Department. It would cover all cases where areas have been deducted by the surveyor making a survey, and also cover such cases where a lake that has been missed by the surveyor making the survey of one township has been discovered and reported by the surveyor making the survey of the adjoining township. I think you can all see the position in which it leaves the surveyor when he comes to run up against any one of these broken lots. For a man to go out and survey a lot now fronting on any kind of lake, I don't think it would be safe for him to touch it with a pole unless there is a description by metes and bounds in the patent.

Mr. Dickson—Did I understand you to say that in dividing lot 12, you would divide so that there would be an equal quantity of land in each part?

Mr. Dobie—What I did was to make a complete survey of the lot as it existed on the ground. The courts say that is wrong; the courts say that since the lake is not navigable that it comes up under this Bed of Navigable Waters Act. The courts say the land has to be divided up, giving each man half of the superficial body of the lot, as well of the land as of the water contained in the lot.

Mr. Whitson—Did the Judge intimate what his view might be if it was properly shown on the original plan?

Mr. Dobie—He made no mention of that at all. In fact, I could not draw anything from his judgment that had any bearing on the case at all, because there was no question about it that all the correspondence and all the official records and evidence of Mr. Kirkpatrick went to show conclusively it was the intention of the Department to reserve the water in that lot. Their Lordships, in the Divisional Court, stated expressly they could not consider the intention, but had to construe the patents as they were passed before them.

Mr. Whitson—The original instructions to the surveyor indicated what was intended: that the water was to be deducted.

Mr. Dobie—Those points were all brought out in the evidence at the first trial, and they were not disputed. I have given the essential points of the history of the lot.

Mr. Whitson—I don't altogether agree with Mr. Dobie that the Bed of Navigable Water Act be amended. I think it would be far better if we had our clause 18 amended in our Act.

Mr. McMullen—If that lake had been navigable water, would there be any question about the division of the lot then?

Mr. Dobie—The land under the bed of the water does not pass with the grant; unless expressly stated to the contrary, the land under the water is reserved..

Mr. McMullen—The broken parts of the lots, then, are defined as being half land?

Mr. Dobie—Yes, where it fronts on navigable waters. It has always been assumed it meant the same on unnavigable waters where it was clearly shown it was the intention of the Department to reserve the water.

The President—It has always been the practice for years, where mining claims were surveyed, that there was a separate claim for the land under the water.

Mr. Dobie—There is no doubt about that. I know in this particular case the lawyers for the other party tried, and they could not get a surveyor in the country that would make a survey any different. They said they would not go because they all endorsed the method on which I had made the survey.

Mr. Dickson—It is one of those things as to which surveyors may differ, and all be perfectly honest; but whether we differ from the judges or not, what the judges say is the law is the law, and we have to take it. Where I lived it was nothing strange to see half the distance between two open concessions contain 150 acres, and the other perhaps fifty acres, but we always drew the line halfway between the two open concessions, and I must say my own individual opinion would differ from the judges somewhat, but I would not dare to give it, because what they said before is law is law, and we have to take it. I have much pleasure in moving a vote of thanks to Mr. Dobie for his interesting paper.

Mr. Beatty—I second the motion.

Mr. Whitson—I would like to have a resolution passed asking the Department to take some action and pass some Act which would

clear up this point. It is one of the most important points we have to deal with in the whole Act. The way the matter stands at present, there is no surveyor safe in making a survey for a division of a lot in that manner. I would ask Mr. Kirkpatrick some time to submit the matter to the Minister, and have the Act amended or a new clause put in our Act, straightening out that point exactly in the same way as the Bed of Navigable Waters Act. It was passed and served a good purpose. As Mr. Dobie has written this paper, and is familiar with the case, and is a man who has suffered at the hands of the law, he should move that resolution.

Mr. Dobie—It was my intention to bring the matter up.

Mr. Whitson—I don't think I would suggest, as Mr. Dobie has there, that that Bed of Navigable Waters Act should be changed. I think it is our own Act that should be changed.

Mr. Dobie—I simply introduced that suggestion as a basis to bring up discussion so that we could get the expression and feeling of the members; but I certainly think the Association should bring this matter officially before the Minister. I may say the Minister has perfect cognizance of the matter, and has had for some time, and it has been under consideration. I would move, therefore, that the Association take steps to bring this matter officially before the Minister, and ask that legislation be drafted to cover this point.

On the motion being seconded by Mr. Dickson, the same was carried.

The President put the motion that a vote of thanks be tendered to Mr. Dobie for his excellent paper. On the motion being seconded by Mr. Beatty, it was declared carried, with applause.

(This Association is not responsible as a body for the opinions expressed in its papers by Authors.)

BOUNDARY LINE BETWEEN AUGUSTA AND EDWARDSBURG TOWNSHIPS.

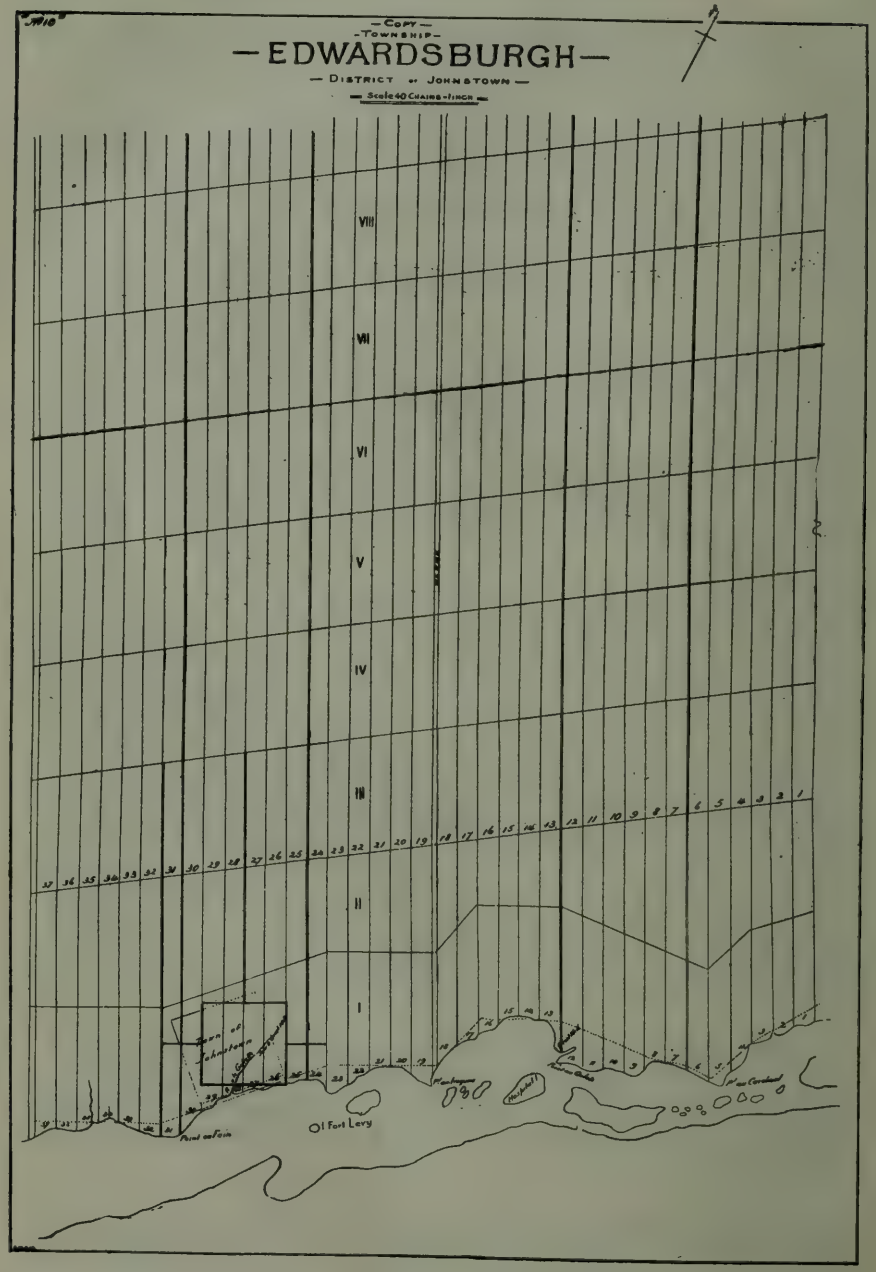
BY WILLIS CHIPMAN.

Early in the year 1912 the Town of Prescott and the Grand Trunk Railway Company entered into an agreement by which the company covenanted to erect shops, roundhouses, etc., upon the town granting certain privileges and a cash bonus. For terminal purposes the railway company secured options upon several hundreds of acres of land to the east of the town and a farm within the town adjoining the easterly limits and north of the existing railway.

In 1885 the writer prepared a compiled plan of the Town of Prescott in accordance with the requirements of the Registry Act, upon which plan the easterly limit of the Town of Prescott was shown as coinciding with the westerly limit of Boundary Street, as laid out from the main highway near the river front, almost to the Grand Trunk Railway line, thence in the same line to the rear of the first concession. This was assumed as the easterly boundary of the town, as it was so shown on a plan prepared by Wm. Gossage, P.L.S., for the Government in 1859, this plan being on file at the Registry Office. Furthermore, the farm lands lying to the eastward of Boundary Street were assessed in the Township of Edwardsburgh, and had always been so assessed. It was generally conceded that Boundary Street corresponded with the road allowance between the Township of Edwardsburgh and the Town of Prescott, although not opened north of the railway.

Mr. Gossage was engaged to survey, and subdivide into building lots the Government land surrounding Fort Wellington, comprising eighty-two and one-half acres. Cut stone monuments defined the angles of this tract, two being set on the westerly limit of Boundary Street.

Before taking up their options, the solicitors of the Grand Trunk Railway Company discovered that the parcel lying to the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Township
— EDWARDSBURGH —
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Scale 40 Chains to 1 Inch
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Town of Johnstown
Point au Fain
Fort Levy

eastward of Boundary Street and adjoining it was described in the title deeds as lying half in the Township of Edwardsburgh and half in the Township of Augusta, and as the easterly limit of the Town of Prescott was coterminous with that of the easterly limit of Augusta, it followed that half of the farms must be within the Town of Prescott. If their contention were admitted, the compiled plan of 1885 was erroneous, and over fifty acres of land, as well as the C. P. R. elevator and other improvements at the river front, which had been assessed for many years in Edwardsburgh, should have been assessed in the Town of Prescott.

The railway company based their argument on the following facts:—

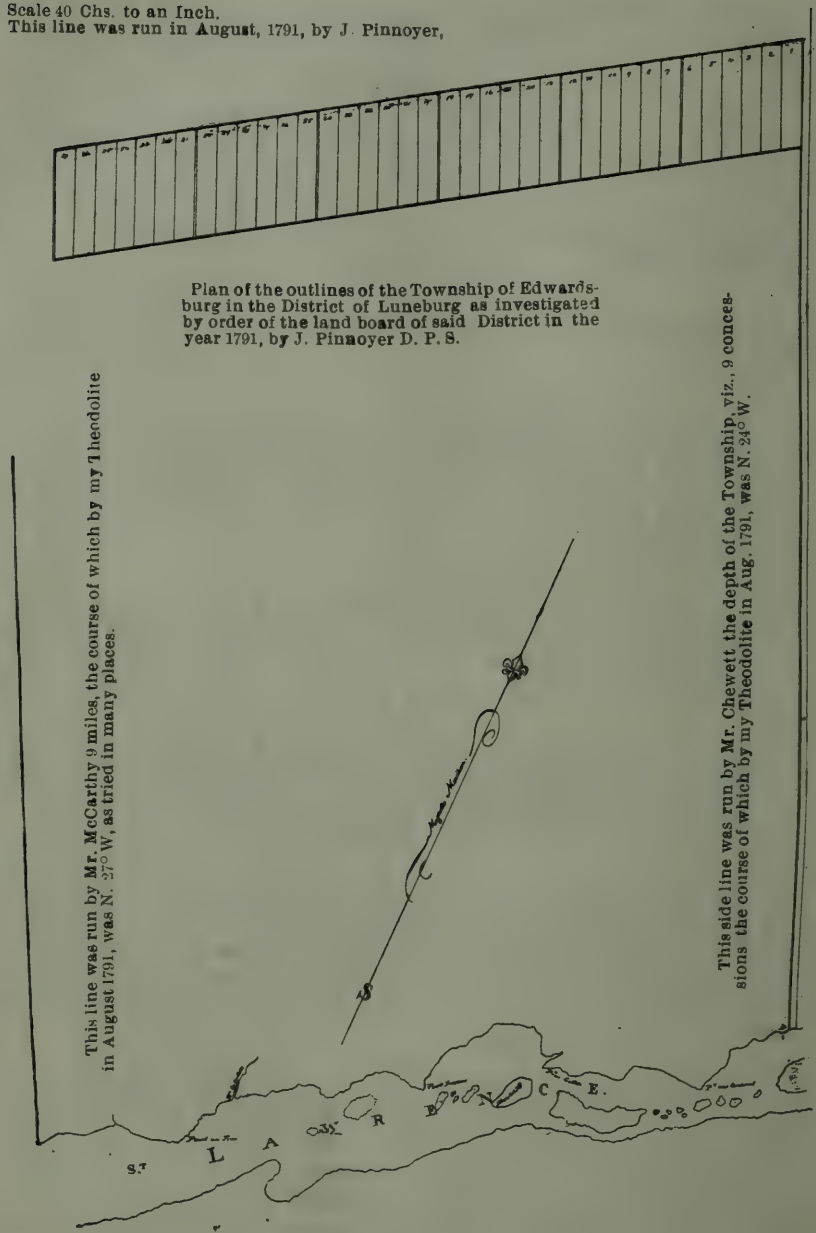
1st. The original patents for this farm, known as the Stuart Farm, were granted in two equal parcels, the easterly part for the easterly commons as Lot 38 in the First Concession of the Township of Edwardsburgh, the westerly part for the easterly commons in the First Concession of the Township of Augusta.

2nd. The Crown Lands plans of the Township of Augusta and Edwardsburgh show a commons in each township on each side of the road allowance between the two townships, the width of each commons being about five chains.

3rd. The original right-of-way plans of the railway line show a commons slightly less than five chains in width in each township, and were purchased in two parcels by the company and registered, one in each township.

As the company proposed to expend large sums of money on this property, and as they had recently been called upon to compensate parties where titles were found defective, they declined to close the bargain for the lands until the matter in dispute had been cleared up, and the writer was called upon to investigate and report.

Enquiries and searches at the Crown Lands Office, Toronto, failed to discover the original plans or field notes of the first, second, third, fourth, or fifth concessions in Augusta and in Edwardsburgh, or of the boundary line between the townships. It then became necessary to collect and study such fragmentary notes and data as were available from many sources, but chiefly those in


Scale 40 Chs. to an Inch.
This line was run in August, 1791, by J. Pinnoyer,
Plan of the outlines of the Township of Edwardsburg in the District of Luneburg as investigated by order of the land board of said District in the year 1791, by J. Pinnoyer D. P. S.
This line was run by Mr. McCarthy 9 miles, the course of which by my Theodolite in August 1791, was N. 27° W, as tried in many places.
This side line was run by Mr. Chewett the depth of the Township, viz., 9 concessions the course of which by my Theodolite in Aug. 1791, was N. 24° W.
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Crown Lands records. Local histories were read and field notes and diaries of surveyors, not on file at the Crown Lands Office, which were in the possession of the writer, were consulted. The last-mentioned data included surveys by Reuben Sherwood, John Booth, Jas. West, and John Burchill, who ran out many of the side lines in Augusta and Edwardsburgh.

The first survey made in the Province of Ontario was that of the River St. Lawrence, which was commenced in 1776 and completed to the "Galops Rapids" in 1781. In 1789 the Post Road from Montreal to Kingston was surveyed, and cedar posts planted at each mile, these posts being numbered consecutively from east to west.

In 1786 William Chewett was appointed Deputy Surveyor-General and took charge of surveys in what was then known as the District of Lunenburgh in the Province of Quebec, this district comprising that portion of Upper Canada lying eastward of a line drawn due north of the mouth of the River Thames, now known as the Gananoque River. Associated with Mr. Chewett were Jeremiah McCarthy and Hugh McDonald. It would appear that McCarthy laid out the town plot of "New Oswegatchie," three miles west of Prescott, afterwards called town plot of Augusta, in 1787.

Between 1790 and 1791 surveys were carried on in the Lunenburgh District, and the remaining portion of the river front was surveyed in 1791 and 1792 by McCarthy.

In "Croils Dundas" the date of the survey of the front of the townships in that county is given as 1783, and in Leavitt's History of Leeds and Grenville the date is given as prior to 1784. Although these two authorities agree, it is probable that the date is taken from the same source, and is doubtless erroneous. No records can be found in the Crown Lands Office of those early surveys, that is, the field notes and plans are missing. There are, however, memoranda and notes which throw some light upon the matter.

On a plan prepared by J. Pennoyer, D.P.S., dated 1791, of the outlines of the Township of Edwardsburgh, it is stated that the easterly boundary was run by Mr. Chewett to the depth of nine concessions, and the westerly line was run by McCarthy for a distance of nine miles. Pennoyer ran the greater part of the north boundary in 1791. (See plan of Pennoyer's Survey.)

In 1810 Reuben Sherwood completed the surveys of the westerly portions of the fourth, fifth, and seventh concession lines, also the eighth, ninth, tenth, and eleventh concession lines across Augusta. He also extended the westerly boundary from McCarthy's nine-mile post to "Fortune's line" at the rear, this last line having been run in 1794.

The evidence is conclusive, therefore, that the line in front of the first concession of Augusta and the line between Edwardsburgh and Augusta were run prior to 1791, and it is probable that the second and third concession lines were run about the same time, or shortly afterward.

There are on file in the Crown Lands Office several plans of the Township of Augusta and of the Township of Edwardsburgh, all apparently being copies of originals that have disappeared. The oldest plan of Augusta is dated at Niagara, 1792, and was copied at that time from the original by Mr. Chewett. (Plans reproduced.)

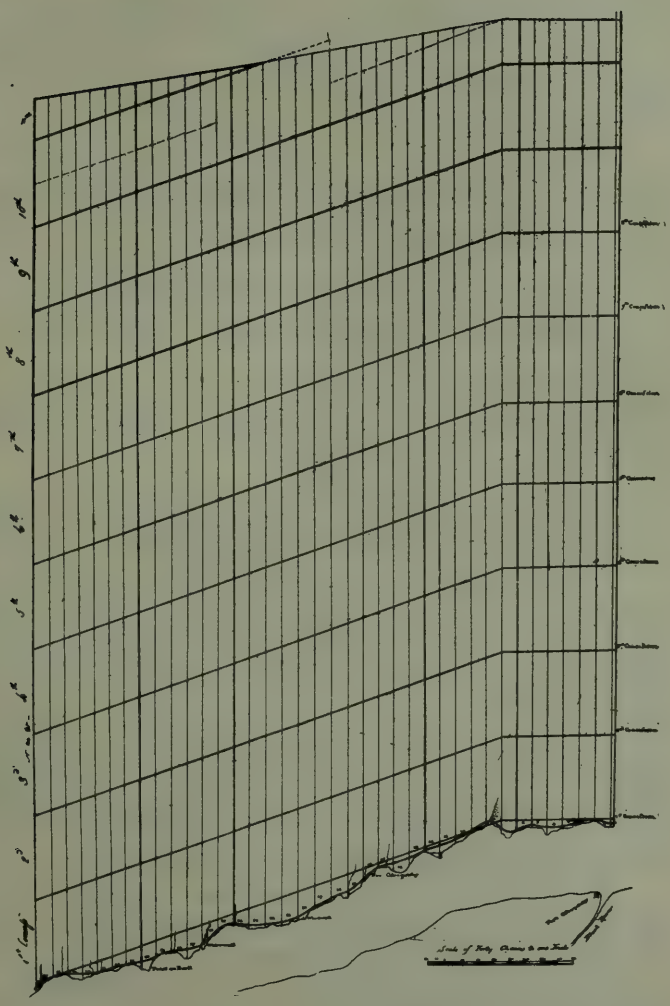
The oldest of the Edwardsburgh plans states that the township was surveyed in 1785 and 1787 by Edward Jessop, Jeremiah McCarthy, and William Chewett. It should be stated that on some of the plans of Edwardsburgh the centre commons is omitted, although this commons exists on the ground. There is a note on one of the Augusta plans that only three concessions were run out in the eight townships (Augusta being the eighth).

These township plans were doubtless projected plans showing how the townships were to be subdivided, but they were probably prepared after the first concession line was surveyed. This is evident from the dates on the plans. Fully half the concession lines in Augusta were not run out until 1810.

When Upper Canada was constituted a separate province in 1792, William Chewett was appointed Deputy Surveyor in charge of surveys, and was removed from Williamsburgh, where he had made his home, to Newark ("Niagara-on-the-Lake"), the first capital of the Province. Hugh McDonald was then appointed Deputy Surveyor for the Lunenburgh District, the name being changed to the Eastern District.

It is possible that the records of surveys made prior to 1792 in the Lunenburgh District were filed at Quebec, or they may have been destroyed or mislaid.

In 1793 surveys were made in Edwardsburgh, and in 1795 in Augusta, of which we have no record, but they were probably the surveys of concessions to meet the demands of settlement.



The alterations on this Plan are agreeable to the several Certificates and Tickets of draught from the Deputy Surveyor General and from Captain Sherwood when Commissioned by his Excellency Governor Haldemand, neglected to be inserted in the Plan returned to the office, by Mr. Jeremiah McCarthy in the year 1787, when employed for this Township, produced the 15th, 1789, and are agreeable to the Plan belonging to the District of Luneburg'

Signed by W. Chewett.

Examined and corrected, agreeable to the Plan belonging to the District of Luneburg. Niagara, 17th October, 1792. W. Chewett.

The plans of Augusta on file at the Crown Lands Office, above referred to, show a commons of uniform width adjoining the easterly town line in every concession of the township, and patents have been issued for this commons in the different concessions as follows:—

Concessions 1 and 2—98 acres, one patent, Thomas Doyle, 1803.

Concession 3—50 acres, lease only to Landon, 1822.

Concession 4—No patent issue.

Concession 5—50 acres, Knapp, 1856.

Concession 6—25 acres, south half, Bissell, 1853.

Concession 6—North half, Drummond,
Concession 7—All, Drummond, } 75 acres, 1846.

Concession 8—No patent.

Concession 9—No patent.

Concession 10—40 acres, McCord, 1862.

In Edwardsburgh the commons, or Lot 38 in the first and second concessions, was patented to Doyle at the same time as the adjoining commons in Augusta. Lot 38, or commons, in the other concessions in Edwardsburgh were patented to different parties subsequently.

It may have been intended originally to run the township boundary between Edwardsburg and Augusta in the centre of the commons, one half of the commons to be in each township, as the town line between Matilda and Edwardsburgh was run through the centre of the commons, and is now so established.

In 1796 Lots 1, 2 and 3 in the front and second concession of the Township of Augusta were granted to Major Edward Jessup, the description being as follows:—

"Commencing in the limit between the commons and Lot 1, at the southeastern angle of the township on the River St. Lawrence; thence north 24 degrees west 215 chains more or less; thence south 66 degrees west 57 chains; thence south 24 degrees east to the River St. Lawrence; and thence along the bank with the stream to the place of beginning, containing 1,200 acres more or less."

The above description antedates the Doyle description by seven years.

Note that the southeast angle of the township is given as the southeast angle of Lot No. 1, that is, the entire commons was considered as outside the limits of Augusta.

In 1822 Major Jessup surrendered to the Government eighty-two and one-half acres of this land, upon which Fort Wellington now stands.

In 1859 B. W. Gossage was instructed to subdivide the Ordnance property and to place monuments at the corners of the reserve. His plan, on file at Prescott Registry Office and at the Crown Lands Department, shows the easterly boundary of the Ordnance land, which was formerly the Jessup property, as the boundary line between the Townships of Edwardsburgh and Augusta.

Doyle sold to Robertsons in 1807, and from the Robertsons the property in the first concession passed into the hands of Sir Charles Stuart, and remained in the Stuart Estate until 1902.

It should be noted that in the transfer from Doyle to Robertsons in 1807, that the commons in the first concession is described as between the two townships, and is included in one description, as follows:—

"Commencing on the River St. Lawrence at the southwest angle of said commons, thence N. 24 deg. W. 105 chains 27 links, more or less, to the second concession; thence N. 66 deg. E. 9 chains 50 links more or less to the limit between the said commons and Lot 37 in Edwardsburgh aforesaid; thence S. 24 degrees E. 105 chains 27 links, more or less to the River St. Lawrence, and thence S. 66 degrees W. 9 chains 50 links more or less to the place of beginning, containing 100 acres, be the same more or less."

This description also places the entire commons in Edwardsburgh.

On the other hand it may be contended that the owners of the commons in Augusta and Edwardsburgh in the first and second concessions would have no object in maintaining a boundary line or the township line which would divide the property, and if such line were originally run in the centre of the commons it might have become obliterated and the posts destroyed or lost prior to 1807.

If, however, this town line were run in the centre of this commons by Mr. Chewett about 1789 or 1790, it does not appear reasonable to suppose that the surveyors who made surveys in the

first and second concessions between 1790 and 1850 would not have retraced the original line or made some note respecting its proper location.

In 1810 Reuben Sherwood completed the surveys of the fifth concession line of Augusta from Lot 10 westward. He also ran the seventh, eighth, ninth and tenth concession lines, and in each instance states that he commenced at the easterly boundary of the township, each lot 1, 2, 3, etc., being 19 chains 80 links in width. He does not mention a commons, and certainly left none. Notwithstanding his survey, a commons was patented in the seventh concession in 1846 and in the tenth concession in 1862.

From a plan prepared by John Booth and William Campbell, dated February 28th, 1849, under instructions from the Crown Lands Department, the town line between Edwardsburgh and Augusta is shown from the River St. Lawrence to the rear of the township, although their surveys were restricted to the lots in the fifth, sixth, seventh and eighth concessions of Edwardsburgh. The astronomic bearings of the town line is given for each concession on this plan, and no jog is shown at any point; in fact a jog would be absurd. Booth and Campbell evidently traced up the town line from the River St. Lawrence, and in their report they refer to consultations with James West, who made many surveys in the Townships of Edwardsburgh and Augusta.

Owing to the confusion respecting the commons adjoining the town line in Augusta and in Edwardsburgh in the rear concessions, a municipal survey was made by C. J. Chapman, P.L.S., plan of which, dated February 10th, 1876, is on file at the Crown Lands Office. This plan shows the commons entirely in the Township of Edwardsburgh, and his report is conclusive that the road allowance between the townships was to be the west of the commons in the eighth, ninth, tenth and eleventh concessions, and it is equally certain that there is no commons in the seventh concession of Augusta.

Upon one of the plans of Augusta on file in the Crown Lands Office there is the following note: "Provincial Surveyor West stated in a letter dated 30th January, 1862, that there was no commons 'A' in Augusta."

If the township boundary line had been run through the centre of the commons prior to 1791, and if it had been tacitly agreed afterward by the adjoining proprietors that the town line road allowance should be located to the west of the commons in the first and second concessions, it would have made a jog at the third

concession of about five chains, or a diagonal line from the south-west corner of the commons in the first concession might possibly have been run to the eastward of the true bearing to the centre of the commons in one of the rear concessions. This does not appear reasonable, as Mr. Sherwood laid out no commons from the original boundary line; furthermore, if it had been done there would have been some tradition at least to substantiate it.

The evidence is conclusive that every surveyor engaged on surveys in these townships from 1810 to 1850 accepted the east boundary of Lot 1 in Augusta as the town line, and as this line is now staked out and monuments planted along the road allowance at the different concessions. The issuing of the patents for commons in the fifth, sixth, seventh and tenth concessions were doubtless departmental errors, due to the commons appearing on the plans of the townships, which plans were prepared before the surveys were made.

There is no doubt whatever in the writer's mind that Boundary Street is the true road allowance between the Townships of Edwardsburgh and Augusta.

NOTE No. 1.

Reuben Sherwood, D.P.S., made an affidavit before James West, P.L.S., in which he states that he was well acquainted with an original monument planted between Lot No. 6 and the road allowance between Lots 6 and 7 in the first concession of Augusta, also that he ran a line between the farms of Capt. S. Covell and Capt. Edward Jessup between Lots 3 and 4 in the first concession, in May, 1795. In another document, which is unsigned, however, he states that he was engaged on the survey of Augusta in 1793 when serving as apprentice with Capt. Stegman, Deputy Surveyor, under the orders of the Land Board of the District of Lunenburgh, Province of Quebec. In this statement he gives the width of the lots in the first concession from the eastern boundary of the township to the western boundary. He does not mention the commons at the eastern boundary or between Lots 18 and 19. Capt. Stegman was a retired Hessian officer, in the employ of the Provincial Government of Quebec.

I am of the opinion that the 1793 should have been 1791, although the year is entered in Mr. Sherwood's handwriting.

The foregoing are recited to show that Mr. Sherwood was well acquainted with the surveys in the Township of Augusta, and that he was consulted by Mr. West when making later surveys.

NOTE No. 2.

The Abstract of Title from the Registry Office of the commons in the first concession does not show how the property descended from Robertsons to Stuart. I am informed, however, that a daughter of one of the two Robertsons married Sir James Stuart, Chief Justice at Montreal or Quebec, whose son was Sir Charles Stuart.

NOTE No. 3.

Prescott was incorporated as a police village by an Act passed 6th March, 1834 (4th Wm. IV., Cap. 27). The boundaries were defined as follows:—

"Commencing at the southeast corner of Lot No. 1 in the first concession of the Township of Augusta, thence running N. 24 deg. W. one mile, thence S. 66 deg. W. one mile, thence S. 24 deg. E. to the River St. Lawrence, thence along the water's edge to the place of beginning, including the harbor in the front of the said town."

There is extant, I believe, a plan of Prescott, which I had no opportunity of examining, prepared about the time the Ordnance property was surrendered by Jessup in 1812, or twelve years before the town was incorporated.

By 10 and 11 Vic., Cap. 47, 1848, the limits of the town were extended, the description being approximately as follows:—

"Commencing at the southeast angle of the Township of Augusta, and not the southeast angle of Lot No. 1, Augusta, thence N. 24 deg. W. to the rear of the concession, thence along the concession line to the centre of Lot 5, thence S. 24 deg. E. to the River St. Lawrence, thence to the place of beginning."

A comparison of the two descriptions is, in my opinion, evidence that the eastern boundary of Lot No. 1, Augusta, is identical with the town line.

An unsigned and undated plan in the possession of Mr. F. J. French, barrister, Prescott, prepared by Mr. James West, shows certain subdivisions of the Stuart property made after the construction of the Grand Trunk Railway and the Ottawa and Prescott Railway. On this plan the line between the townships is shown as the westerly side of the commons and the easterly side of Lot No. 1 in Augusta.

NOTE No. 4.

In the patent to Doyle the width of each half of the commons is given as 4 chains 66 links, which would make the commons 9 chains 32 links in width.

In the deed from Doyle to Robertsons the width of the commons is given as 9 chains 50 links, and it was assumed to be of the same width at the rear of the concession.

Throughout the township the width of the commons is given in the patents as between nine and ten chains, all being more or less.

On Booth's and Campbell's plan the width of the commons is given as follows:—

Concession 5—9.66.

Concession 6—9.78.

Concession 7—12.14.

Concession 8—9.97.

Concession 9—10.43.

In a note on the plan, however, Concession 5 is given as 10.28 and Concession 6 as 10.17, owing to some error made in plotting, which is referred to in a note.

On the plan of survey made by M. J. McLennan, O.L.S., July 15th, 1912, he gives the width of the commons on the Montreal Road as 10 chains 5 links, and in the rear of the first concession as 6 chains 60 links, the average width being 8 chains 33 links.

NOTE No. 5.

The right-of-way plans of the Grand Trunk Railway, 1852-1853, show the commons between Augusta and Edwardsburgh as divided equally by the township boundary line, the total width as scaled from the plans being about 9 chains. As the entire commons was then owned by Sir Charles Stuart, and there was no line or fence in the centre of the commons, it is probable that the engineers of the railway company laid down the township boundary after an inspection of the plan of the township on file in the Registry Office.

The foregoing notes Nos. 1, 2, 3, 4, 5, are, in the opinion of the writer, additional evidence that the commons was not divided into two parts by the town line.

DISCUSSION.

Mr. Chipman—I think a little more attention should be given to surveyors studying the old documents. They are sometimes difficult to obtain, but the Crown Land Plans are not unavailable. I thank you.

The President—This paper is now open for discussion, Gentlemen.

Mr. Dobie—I would like to ask Mr. Chipman what was the upshot of the case, or did it ever come to a final conclusion? Were the plans recorded in the Department accepted as the final thing, or were they upset. Who was right? The original plans or the notes showing in the correspondence of the surveyors, which were not on record in the Department?

Mr. Chipman—This report was only made in July or August. It is under consideration yet. I don't know what the Department will do. I don't think they will go to court over it; I think they will settle it in some way.

Mr. Dobie—I would move, Mr. President, that this paper be accepted and printed in the proceedings of the Association, and a vote of thangs be tendered to Mr. Chipman for the excellent paper he has read this afternoon.

Mr. Ross—I second the motion.

The President put the motion, which, on a vote having been taken, was carried, with applause.

The President—I am sure we have to thank Mr. Chipman for this very historical and interesting paper.

(This Association is not responsible as a body for the opinions expressed in its Papers by Authors.)

NOTES ON WAWAITAN FALLS POWER PLANT.

BY ROBERT LAIRD.

Wawaitan Falls, on the Matagami River, are about 18 miles southwesterly from the recently discovered "Porcupine" gold camp, and consists of a series of rapids, where the river, in its northerly running course, flows in a great elbow-bend for a distance of nearly two miles.

The total fall, before the improvement, was about 110 feet; it is now 118 feet from still-water to still-water.

The minimum flow, as determined by gauge, was found to be 400 cubic feet per second, and the period of lowest water was from about the 1st to the 25th of April.

The Power Inprovement Works cut across this bend and have a total length of a mile and a quarter.

The plant consists of a concrete dam, a canal in rock, a head-gates, a steel penstock and surge tank, a reinforced concrete power house, a race, and a 24-mile single line transmission.

The concrete dam is 1,000 feet in length, 750 feet of which is of the solid retaining wall type, whose average height does not exceed 8 feet, as the dam is, in part, built on a rock island in the river channel and the shores are of rock and are abrupt.

The main, or easterly, river bed is about 150 feet in width, and the dam there has a maximum height of 22 feet; the westerly river bed is about 100 feet in width and the maximum height there of the dam is 12 feet.

The portions of the dam closing the river beds are of the pier and sluiceway type; wooden stop logs are used.

The spillway is 150 feet in width and is immediately west of the westerly river bed; it is furnished with flash-boards.

The original water level of the river, above the dam, is raised 5 feet for a distance of about 22 miles, and now has an average width of a quarter of a mile. At the head of this stretch a further lakelet extends for 29 miles, and this could be made a storage basin at small cost if such was found necessary. The canal in rock is

45 feet in width, has an average depth of 20 feet, and is about 2,000 feet in length.

The headgates are of concrete and are contained within the rock canal at its northerly, or inland end, and enclose the southerly ends of two 12-foot steel penstocks; only one of which is completed; the second will afford a duplicate system when the demands of the future warrant. Steel gratings and stop log checks are also in position here; the grating is up-stream of the stop log checks. No special provision for ventilation of the penstock is here attempted, as the same is nearly level until it delivers into an amply-ventilated surge tank.

The penstock is 12 feet in diameter and 1,800 feet in length, and is built in the usual stove-pipe fashion. It terminates in a steel surge tank 40 feet in diameter and 35 feet in height, with steel roof and floor. The penstock has a fall of 4 feet in this length and is laid in a trench, cut through sand, of average depth of 10 feet. The bottom of the 12-foot pipe is 4½ feet above the floor of the tank where it joins same.

The surge tank is set back about 150 feet from the crest of the hill overlooking the river.

Two 8-foot diameter steel pipes leave the tank (their bottoms being 6 inches above its floor) and lead to two Allis-Chalmers water wheels; they have a maximum grade of 13 per cent., and about midway they are anchored to a rock outcrop; each has an expansion joint about 70 feet from the wheels, with an anchor block near same and an additional thrust block just in front of the valves; a bursting valve of the hinge type is placed on each pipe between the expansion joint and the thrust block.

The main valves (8 feet diameter) are of the butterfly type and are automatically controlled. These pipes are placed 18½ feet c. to c. until they pass the expansion joints, where they separate by "S" bends and enter the power house 20 feet apart. They are laid in a trench, averaging 6 feet in depth, cut in sand.

Throughout all the above trenching the pipes rest on 8-inch x 12-inch sleepers, the full width of the trench in length, and 4 feet c. to c.

The power house, on rock, is a reinforced concrete structure with steel frame and trusses supporting the roof, also of concrete, and a 4-ton crane, 45-foot span. The main part is 45 feet x 68 feet x 32 feet in height, with a 12-foot x 68-foot extension, 18 feet in height, and with a tower for outgoing wires, cells, lightning

arresters, etc. All fittings, windows, doors, etc., are of iron. The power house contains the two water wheels, two 2,500-kilowatt generators, two exciters, switchboards, etc., etc.

The draught tubes are formed in concrete; those of the exciters are iron and deliver through a side gallery into the race.

The tailrace is 100 feet in width after leaving the power house, averages 15 feet in depth, and was excavated part in rock and part in earth. That part of the race within the power house is 22 feet in width and has an arched roof 10 feet above water.

If the following requirements, made by the Government when allowing the lease for this improvement to issue, are kept in mind, one will better appreciate the effects of altogether unexpected difficulties, which had they been known in time, would have totally altered the method as planned of the prosecution of the work, but the time limits left no alternative, for when those difficulties were met it was then too late to change; and as one of the foremen expressed it, "Nothing left but 'go to it' by bull strength and your finger nails." He spoke, of course, of the absence of plant which would otherwise have been brought in during the previous winter, when team haul was possible. These requirements were: a substantial beginning made by Sept. 21st, completion by May 21st following. It was not expected that the limiting time for completion would be deemed a forfeiture in the event of the work not being wholly done, but an officer of the Government inspected in September and intimated that a very fair approximation to completion would be demanded in May.

The T. and N. O. Railway were constructing a spur line towards Porcupine, and as soon as the steel reached Golden City in the month of July the first consignments of the Improvement Company's supplies and outfit were delivered there, and were hauled along an unimproved trail, cut and used by the Hollinger Mining Company during the previous winter, for a distance of about 12 miles to the Matagami River.

This haul was, of course, anticipated and was in great part the deciding factor in the selection of the plant to be used on the work.

The tales of woe of this road—indeed, the more prominent of them alone have whiled away many a winter's evening—the shattered wagon, the upside down boiler, the sink hole, the broken bridge, the miles of corduroy, the shifting of headquarters as the steel advanced, and the new-cut roads have each their tales

A gasoline launch, two pointers and a scow had been forwarded to the river during the previous winter and were used to make the run to the falls; a distance upstream, of about 22 miles. This at the beginning was easy, but later, when the Sandy Falls Co. were compelled to let the water off in order to make some changes in their layout, things were quite different; rocks and rapids, shallows and pump-filling sands made their appearance, and that too when things were busiest. The river fleet now consisted of three launches, each one more unreliable than the other—as is usually the case when continuous haul at top power is asked of that type of engine; but as the river was only two feet deep in several stretches, they had to do.

Three scows, 45 feet x 15 feet, had also been built and worked well while the water was high, but later the tale of woe of the all-day and all-night shepherding of them through rapids, the polling, the pushing and the wading with a temperature down close to freezing was quite a different story. The road, too, at the falls had grown from three-quarters of a mile to one of over two miles in length; its character was changed; at first, nearly level, now it had to pass up over and down a hill 90 feet in height. All this was unfortunate, but was in a measure anticipated. The "Super" lived through it, but got little credit for the item "costs of transportation."

In the meantime the work of building camps, clearing the pipe line of trees, and the building of a coffer dam had been pushed, so that when the inspector arrived he found "something doing" and things on the works looked promising.

The first shock came when soundings were made at the site of the power house; a pit had been ordered dug to rock, shown on the profile to be 4 feet under earth; at about 3 feet water was struck, and the foreman reported that he couldn't find rock with a crowbar. A longer rod was tried; then the longest in stock, 17 feet; still no bottom—and the bottom at that point has never been found.

Considering the matter afterward and keeping in mind the facts that the whole area was water saturated and that the soundings were probably taken less than a month after the winter's snow had left the woods, it is likely that what was supposed to be rock was nothing but ice or frozen ground; a rock outcrop, near at hand, also helped to deceive.

Careful soundings disclosed the fact that a narrow hog's-back of rock, about 200 feet wide, did exist at a point about 250 feet further inland, and upon this it was decided to build the power

house. This rock fortunately rose to an elevation of about 3 feet above the water level of the river in front of it, but was covered by 10 feet of water-saturated earth, and it was therefore necessary to drain this by a ditch 400 feet long and 10 feet deep to river level, before excavation could be begun. The digging of this ditch disclosed the first indication of trouble; overnight a deposit 4 inches to 6 inches in depth and 50 feet in length was formed upon the previous day's work, and this was hard enough to require the use of the pick; quicksand, or travelling sands at the least, was anticipated in the low-lying areas; and such proved the case.

This sand was so fine that it flowed with the water wherever water could go; and even in the extremely cold weather it issued along with the water from springs and flowed out upon the surrounding ice and made that almost indistinguishable from a deposit wholly made of sand. The excavation for the power house was begun; using slush scrapers. In the prosecution of this work the first essential was to keep the earth dry—for a wet or water-laden part soon worked up into a bog under the horses' feet, but was solid and workable when dry. A paradoxical condition was noticed —after the sands had travelled and though still under water, they formed into a compact deposit on which the horses could walk without sinking, and, indeed, into which it was difficult to drive a wooden stake. A further difficulty was the things the sands had covered and preserved in the years: logs as sound as when they fell; tree stumps, with even the bark preserved, and some of them standing 6 feet high, still firmly rooted amongst the rock crevices. The devices tried to be rid of these were many; it was found best to work around the stumps until the excavation came close to the roots, when a pit was dug and the axe and the powder-man did the rest. Cutting down the stump piecemeal was only a snare for the scraper mouth and a cause of dumped loads and much—very much —profanity in any of seven different languages.

Of course hurry calls for a derrick had been sent on the first signs of trouble—but there were hurry calls for other things—that for food enough for 300 men being no small one—but at last a boiler and hoist, the irons and cable, arrived; in the meantime the boom, legs, and other timbers were cut in the woods and hauled to the site and the carpenters set to work upon them night and day.

The consoling thought had been, "When we get up in the fine dry sand on the hill it will be a snap." One of the assumptions was soon found to be wrong, it was not dry; the other was underestimated—it was fine, but far finer than desired, and proved again to be the trouble maker. The excavation in earth for the

headworks disclosed water-saturated soil at a depth of 3 feet, and as the earth overburden to rock averaged 10 feet a realization that we were up against it came, easily. At this time the foreman made his comment, before quoted. An offtake ditch was dug to a nearby ravine, and the tale of that ditch is disheartening; every inch of its 600 feet length, bottom and sides, was poled to keep the sand out of it, and it had done its work for less than a month when the cold weather set in and froze it solid. Pumping was resorted to, and succeeded.

The trench for the 8-foot pipe and about 500 feet of that, for the 12-foot pipe presented no difficulty, but the remaining 1,500 feet has its story.

The trench had been opened and dug at several points to grade, then allowed to fill with water and left until such time as the excavation should be brought forward from the hill face—and so secure drainage. When the work did reach them they were nearly 2 feet above grade. This led to a careful investigation, and it was found that in many places the trench bottom was 6 inches or more above grade, and it was also seen that the trench had narrowed in many places more than a foot, and at one point nearly 2½ feet in its width at the bottom. What was happening was this: the weight on the sides was pressing in the wet material near the bottom and also bulging the bottom upward. The material of the bottom was of the consistency of putty; as one walked on it he sank quite perceptibly, but did not break through the surface; one's footprints were a well-defined hollow surrounded by a little puffed-up, rounded ridge. The sensation was uncanny; one feared the next step might land in a place of no bottom; one had visions of disappearing, but never did; fortunately for the preservation of the part done, a cold snap made the whole thing solid as rock; but unfortunately it also turned much of what remained into rock also, but rock that would not shatter as rock should when blown. Night and day shifts kept ahead of the frost and in soft material, where the depth was considerable, but depths of a foot or less had to be removed by the pick. This night-shift business with a temperature hovering about the 40 below zero mark and one's feet in water did not produce a cost sheet one would willingly show—no one boasted about it. There is a great difference, you know, in his manner when the boss says, "Yes, I understand; you did remarkably well under the circumstances," from his manner when he says, "Under the estimate; that's good." The latter circumstance sometimes leads to a bonus; though the former more often deserves it.

The last unusual effect of the time limit that will be mentioned is the pouring of cement at low temperatures.

This was of small concern in the case of solid work, anchor blocks, foundations, etc., that could be kept covered and heated by stoves, but the thin 6-inch walls standing exposed for a height of 30 feet and more above the ground was quite a different matter.

Warm water was kept on hand and the gravel heated, the thermometer watched, when it rose to 10 above zero and seemed likely to stay so for an hour or more pouring was done.

The cement froze, of course, and remained frozen for months, but it seems none the worse for that; though not so smooth and neat in surface as would have been the case had the carpenters been more comfortable while setting the forms.

There was one unusual feature of the prosecution of this work that deserves mention—a complete fabricating plant, iron shed 40 feet by 100 feet, containing boilers, compressors, punches, shears and rolls, was erected on the ground, 24 miles in a direct line from the nearest railroad, and there the whole steel work was made.

The reason for this was the difficulty of handling, because of their weight and size, the lengths of the pipe over the trails, to say nothing of the space they would have occupied on the scows.

The plates arrived in the condition they left the steel works, were punched, rolled, assembled into 15-foot lengths, painted and handled by derricks and hoist from the shed onto a large sled in the trench; and by cable and hoist were hauled to place and riveted to that already set.

Owing to the frozen condition of the earth, and water not being available to test the pipes, it was not possible to cover them, as should have been done at once, and this brought to notice the great effects of expansion and contraction.

It was observed that the roof of the surge tank appeared to be warped at times. Examination showed that the pipes in their motion were pulling or pushing the tank; the steel floor, close to which they were placed, being rigid, threw the whole force upon the walls, and the resulting action was not unlike that of the opening and closing of a pair of compasses—with the added danger to those parts of the tank walls close to the joints through short, often-repeated bending. The collar of the 12-foot pipe was therefore freed and allowed to slip back and forth on the pipe; watchmen were assigned to see that the parts, if they separated during the night, were again properly entered when expansion made that

possible, but failing to do so one morning the collar was caught at one point and the ½-inch steel of which it is made was crumpled like a piece of tin.

A further evidence of the force exerted was perhaps better illustrated by the motion given to the tank (a structure of steel 40 feet in diameter, 35 feet in height, and weighing about 70 tons) by the 8-foot pipes. It was found that the tank was being pushed bodily over its foundation, often as much as 7½ inches, during the morning, and drawn back again at night.

Discussion.

The President—There are certainly some very good pointers and suggestions to be had from this paper. I am sure we are very much indebted to Mr. Laird for the care he has given to this paper, and in consenting so readily to present it before the Association.

Mr. McMullen—Mr. Laird, would there be any material contraction and expansion after the pipe is covered?

Mr. Laird—There was an expansion joint that was considered sufficient. The temperature of the water was found to be varying from 34 degrees to 60 odd degrees. The expansion joint provided sufficiently for that; but while they were being covered they were exposed to 40 degrees below zero, and were in bright sunlight during the day, when the temperature would perhaps be at zero.

Mr. McMullen—I suppose that was the reason you had the extension on ties—to provide for the sliding?

Mr. Laird—Not altogether. The bottom was soft.

Mr. Wilkie—I have listened with a good deal of interest to this paper, and it affords a good deal of information for those who are dealing with structural steel. I think it is an excellent paper, and I would move that this paper be accepted and printed in the proceedings, with the customary vote of thanks extended to Mr. Laird for preparing the same. On the motion being seconded by Mr. McMullen, the same was carried, with applause.

(This Association is not responsible as a body for the opinions expressed in its Papers by Authors.)

COLONIZATION IN NORTHERN ONTARIO.

BY H. M. ANDERSON.

Mr. Anderson—Mr. Chairman, I take pleasure now in taking advantage of the suggestion of Mr. Whitson to make a few remarks on your address. I am glad to see while in Toronto, which is representative of older Ontario, that one who has come to the country which I and some other young men here represent can speak with such conviction of the things you have found there; and personally I as the representative of those men who make the north their home would like to say that I would like to see this paper that has been presented by yourself made as public as the press can possibly make it. I am aware that a great deal of criticism has been lately expended on the north by some one who was in an official or semi-official capacity, and it is, sir, a thing which has stirred a great deal of antagonism in the north; it was a criticism which was entirely unwarranted, and the antagonism will be evinced in a much more definite form if we have a recurrence of the trouble. I have not confined myself in this paper to any details, and I am thankful to find you have given those in yours. I believe the best advertisement that a subject of this kind can have is that one after another we get bump after bump, and after awhile we will get not only the land surveyors who have not seen this territory, but the others who have, to know that by a succession of knocks there is something there.

This paper I might say should be "Colonizing" rather than "Colonization", and I am not sure I have the right title yet. I simply want to arouse the enthusiasm of those who have not yet seen this country and of those who have, who are familiar with it, to get behind the ball. (The paper was then read and received with applause.)

In prefacing my remarks on a topic with which you as individuals, and this Association as a body, is so familiar, I cannot hope that any of my remarks may be called original. Too many excellent discussions have been presented before your body to permit of any originality in any resume I might present, and, therefore, I shall not bore you with details in finite particulars. First and foremost, gentlemen, I am here not to entertain or instruct

your body so much as I am here in the interests of New Ontario, to try to awaken and to reawaken your interest and to enlist your united endeavors in the upbuilding of our vast North Land; in order that we each by our individual efforts may have some hand in the colonization of that vast heritage—that we each in a small way may act as an immigration agent.

When one comes face to face with Blue Book statistics of our Canadian immigration he is appalled at the immensity of that influx. From immigration statistics the year 1912 went almost to the 400,000 mark, and, of course, the West got practically all of these. To one living as I, in the Winnipeg of New Ontario, the gate through which all these must pass, and where is permitted closest observation of the immense ingress of these travellers to the West, and of the very limited ingress into our own North Land, one cannot but sigh to think of the result were that vast stream diverted to our North for but a week or two. Conceive, if you can, of a stream of exceeding 1,000 per day for seven days a week the year through, and you have an approximation for the past year. Conceive again, if you can, this stream pouring into our North Land but for two weeks out of the fifty-two—I trow this would create a stampede that would rival some of those mining rushes we have had up there in recent years. That 14,000 would mean at a conservative estimate 2,800 homesteads, and that over twenty of our six-mile townships. So far as my observation has been, I find that a contented settler is the biggest advertiser the land can possibly have. A case in point, in brevity, and under my own observation, a native of Galt who had listened and heard "went out for to see" and landed at Cochrane. He came, he saw, he conquered, and now he and his two sons have each located near there, and beside them some of their Galt friends have homesteaded. I do not wish to infer that New Ontario should be built up at the expense of Old Ontario—far be that from me—but I do contend that we, as good citizens of Ontario, should preserve to that Ontario, whether New or Old, whatever of immigration there must be and to ensure for her as much of the foreign immigration as we possibly can. I know of foreign communities in the West that are recruited from a single village in some of the foreign lands—due to the pioneering of a single member of that foreign village in this country.

What of the area of this North Land? As well could one grasp any definite idea of Space's immensity after years of astronomical study as to grasp this vastness. To speak of it in millions of acres or hundreds of square miles conveys no impression to the lay mind, and defies even the imagination of an Ontario Land Sur-

veyor. Oh, no! New Ontario is so immense that a new unit of measurement must be coined to adequately convey of its immensity.

What of the productiveness of this vast clay belt? First and foremost, every homestead up there has ready and waiting for its claimant a ready-made crop—a crop of pulpwood—which year by year is increasing in demand and in value. Thanks to the T. and N. O., the T. C. R., and other new lines cutting through this clay belt, in conjunction with the hundreds of miles of roads being constructed by our Mr. Whitson, this first product of the soil is brought into direct communication with an ever-increasing demand and a hungry market. Furthermore, pulp plants are coming to the site of the raw material, and we have large plants at present establishing at Mattagami on the T. C. R., at Iroquois Falls on the Abitibi, and at various other points throughout the north. You are all familiar with the capabilities of the soil in the matter of domestic growths; it is not necessary for me to make any enumeration regarding these. Suffice it to say that I, as many of you, have seen, handled, and tasted all our common roots and vegetables, as potatoes, cabbages, lettuce, turnips, beets, etc., etc., of a quality and growth never excelled even down here. I have in my possession photos taken by myself of oats and timothy hay growing on an old tote-road along the Transcontinental Railway. Actual measurements showed these grains to be quite six feet high and with six inches of a well-filled head. An Old Ontario farmer would rejoice at a double tonnage crop such as this—which was indeed but growing wild. Need I say anything more along this line—I do not think it is necessary, for you can all recall what you have seen of this same wonderful growth. I shall remember for long the luxuriant growth of good old-fashioned flowers at the engineer's residency on the Mattagami River, nasturtia, honeysuckle, and geraniums, and this, mark you, in that barren, frosty and cold wilderness that some would have us believe this country is. No, my friend, Jack Frost and the wolf go hand in hand, even as they did in Old Ontario. Banish the one and the other follows.

Finally, in the matter of water powers, we find this new land most significantly endowed. So immense are they and so numerous that their enormous capacity is almost beyond computation. One day we must find along our railway lines up there group after group of manufacturing centres, feeding on and propelled by this endless supply of white coal—the homes will be lighted, factories run, trains propelled and farms tilled by this, which shall be known as rural electricity; so abundant, and so cheap, as to be the farmer's best friend, as well as the townsman's indispensable necessity and convenience. Nature, in her all-wise providing, has laid this land

under no obligation to fuel famines and coal strikes, she is supremely independent of one and of both.

Gentlemen, in closing, do not these things carry the stamp of truth? Standing on the Transcontinental, that great steel backbone of this unrevealed New Province—and far to the south—and far to the north—and far to the east—and still farther to the west—these things are true. This same steel backbone shall one day be the father of numerous kindred ribs stretching far north and south, feeding, and being fed from, the prosperous civilization of these waiting forests of spruce. Here is surely a chance for us all. Shall we not cheerfully—nay, with intense ardor—do our own small best to hasten the populating of this heritage of ours, a great vast land, of unlimited vitality, of unrevealed possibility, of wonderful latent capability, and only awaiting the hand of the tiller to awaken it to grand reality.

The land up there is the equal of the best the West has left to offer us. Have we any cause for shame in recommending it? I do not think so. Fifteen years ago the West started to create a boom in Ontario manufactories that has not yet slackened, but has grown and grown till it has assumed a proportion such that there is scarcely a factory in this Province to-day is, even with overtime, able to keep abreast of orders. What would it mean for Older Ontario to have another boom such as this, but right at home here and almost at her doors. I need not enlarge on this, for its significance seizes you all.

Now, in the name of this Newer Ontario, and in the name of that Older Ontario, I call you to do your best, and freely. Not always is the soldier the man who serves his country's needs the best; for, as you have heard, "he also serves who only stands and waits." Let us each stand and wait—wait on New Ontario—the last and best of our great Canada—the land of forest, field and unharnessed river; let us each, Mr. President and Mr. Secretary, Mr. Individual Member, pledge ourselves not to desist until by our own personal efforts one settler at least has been located—your one may mean ten—and your ten a county.

Discussion.

The President—I am sure, gentlemen, that we are all very much indebted to our friend, Mr. Anderson, for this eloquent and powerful paper. It is now open for discussion.

Mr. Dobie—Mr. President, I think it is only right that we should congratulate Mr. Anderson on the manner in which he has handled this question, and at the same time I would like to endorse the remarks Mr. Whitson made shortly after you delivered your

inaugural address as regards the remarks that have been made regarding that country in the past few months in the press. It seems to me that what Mr. Whitson said is strikingly to the point, that the remarks and ideas of a man like yourself who has spent years and years in that country, who knows every township in it, and who has seen more of it than all the rest of the surveyors put together, should have some weight at least in the future, when we come to consider the remarks that have been sent broadcast throughout the land in regard to the clay belt, in the press in the past few months. When we take a man who goes through the country as I understand one man did, went along on the Trans-Continental in a motor car—I went along there too in a motor car last summer and it kept me busy keeping my hat on, and I certainly did not see very much of the country, certainly not enough for a man to go out on his own responsibility, and on the responsibility of what he saw in a limited trip like that, and condemn the whole country. I think the surveyors should take a strong stand in regard to that, because the Surveyors know more about it than anybody else in the province. I think the word of Surveyors should carry some weight with it, and that it should be accepted. The public look upon the Surveyors as knowing more about it, and I believe they attach a great deal of weight to what Surveyors say. I don't think it is right that remarks of that kind should go unchallenged by this Association, because I think it is the universal experience of the Surveyors that the agricultural possibilities of the country are something beyond calculation. I have spent practically all my life in the north country. Last week I was up making a survey for a man near Bruce Mines, and I can remember when that farm was just exactly as the clay belt is today; it was swamp land covered with scrub spruce, that looked as though it was a bog. I know that men passed by that and went and located on lands simply not in the same class because they did not understand what the land required. This man went in there and he told me the other day, when he first went in, he had offered to sell out for $300, and could not get anybody to give it to him. Now that man has 200 acres there that I would put up against any prairie land in Western Canada. There is not a stump or stone on it, and every part of that land is arable land. He has splendid buildings and land. That man started on land that is typical of millions of acres that are just exactly similar in the clay belt.

Mr. Anderson—It seems primarily that the representatives of New Ontario are going to have to bring this matter before the Association in a very forcible manner. I have spoken with some of the members and some of the Northern surveyors, and I have spoken again to some of the business men and others in our north-

ern country there, and the feeling is, I cannot express it in any other terms than intense, that such a gross misrepresentation has been made. Mr. Dobie has outlined a suggestion which I think should be dressed into practical form and made to redound to the contradicting of this statement. I think that the President's address, at least that portion of it that deals with it, should be given publicity on the authority of this Association. There is no question about it. I, for myself, can almost bring absolute proof that this man that made the report was holding on his hat at 35 miles on hour. I don't wish to commit myself, but I can almost bring proof that his investigations were nil. I should like to see a suggestion, if not a motion, that the President's address be treated in this manner.

Mr. Whitson—I agree with the last speaker about the report that was made. I don't know that it was made on a 35-mile-an-hour pace, but I know this: that on his return from Cochrane they were waylaid in a snowstorm, coming down in a motor; the batteries froze up, and they had to push the car quite a long distance, and spent the night and part of the next day in a water tank; so that a man coming out of a water tank after about fourteen or fifteen hours was not in a condition to give a very favorable report of anything he had seen. I can agree fully with what has been said with reference to the class of lands in Northern Ontario. In fact, I had a little experience this last season in opening up some of that country, and I found in almost every instance no difficulty in draining the land, and although the season was very unfavorable, wherever crops had a fair show last season they matured. The soil is as rich as can be found in any part of Old Ontario.

Mr. Wilkie—Mr. Chairman, I would like to say I have listened to this address of Mr. Anderson's with a good deal of pleasure, and I think it has been customary for the Association to accept the papers and move a vote of thanks, and it is for that purpose I rise. I therefore move that the paper be accepted and the writer be given the thanks of the Association. I would like to add in connection with that, although I have not had the pleasure of much experience through that northern country, I did make one trip into it; I went along the National Transcontinental Railway from Cochrane to some 30 miles west of it, where I think what is now called Hearst is located. When I returned from that trip and spoke to my friends about what I had seen there I said that I saw no reason why some day 75 per cent. of that country should not be first-class farming land, and I have maintained that up to this time. There is some of the country which undoubtedly is not favorable for farming at

the present time, being covered with more or less muck, or some such formation as that; but if we go into Older Ontario we will find practically the same thing. Go down along the Ottawa Valley and the Ottawa River in what is now the Township of Caledonia and Longueil, and in the earlier days that country was almost similar to what I have seen in Northern Ontario. It was practically a cedar swamp—very much of a bog. As time went along, timber was taken off it and fire took the muck off it, and to-day it is all first-class clay, and I think there is there about the best clay raising land in the Province of Ontario; and there is no doubt that is just exactly the description of the piece of land which Mr. Dobie described a few moments ago. There is no reason why this northern country will not be almost similar at a later date. It will take a little time, but it will be so later on.

I have much pleasure in moving that Mr. Anderson be given a vote of thanks for his paper, and that it be printed in the proceedings.

The President put the motion, which, on a vote having been taken, was declared carried, with applause.

The President—I am sure we are very much indebted to Mr. Anderson for his paper, and for the discussion that it has brought forth, and if there is any practical way in which we can do it here and now this might be an opportune time to do it. Have you any suggestion, Mr. Whitson?

Mr. Whitson—I would like to hear some remarks from our veteran, Mr. Dickson. He has had long experience in Northern Ontario. He is a man who has seen a great deal of the Muskoka and Parry Sound country and the Manitoba district, and is able to make comparisons. He was inspector for some time in the early days, and travelled over a great many townships.

Mr. Dickson—I was amused, Mr. President, when I was in that country when I thought of the articles that I had seen in the public press, articles written in the back country, and also when I read the speeches that had been delivered in the House, stating what a miserable country it was. I was amused to see how the people would go and make fools of themselves talking about what they didn't know anything about. Probably I have seen more of that country than any other gentleman present, because I have done a great deal of surveying and spent eight years surveying in the Northwest besides, and I was fifteen years Inspector of Surveys. Now, I suppose you are nearly all familiar with the country around Cobalt, south of the watershed, between it and James Bay, and what a rich country there is in between 25 and 26 Townships, and

I think I am safe in saying 75 per cent. of those townships is equal to any part of Old Ontario or Manitoba for farming and so on. It is not at all as hard to clear as the farm land in Ontario. You get the ridge between the two countries, and there are a good many miles of it that are not good lands, until you strike the clay belt, and from that out as far as I have been it is equal to any part of Old Ontario. It is timbered country, but a man can clear five acres as cheaply as he could clear one acre in Ontario when I was a boy. The timber is small and good; the land is comparatively level, well adapted for dairying purposes; it is a high plateau all along there, interspersed with gullies, and you have got a natural drainage there without any trouble. I was told by one of the engineers on the Grand Trunk Pacific that there is one place after you cross the Abitibi River where there is a tangent of forty miles of a perfectly straight line, and the highest grade is four-tenths of an inch to 100 feet. They are taking very great care, also, in clearing their land when they are building the railroads, to preserve the timber. When the C.P.R. was built they seemed to destroy as much timber as they could; there was no care taken whatever as to fire. In this case all the timber outside of the right of way was scarcely tinged. As to the water power—it is the wonder of the world. I am surprised to see the people of Canada exporting any wheat, because if you take the transcontinental railways, you can hardly go 20 consecutive miles across the prairie where you do not cross first-class water power. All you have to do is to harness what nature has provided, and there is water power enough in Ontario to grind all that will ever grow in the Northwest. I think that the day is coming when what is now called New Ontario will outstrip Old Ontario altogether. It is most of it south of Manitoba, and five or six years ago, when I was over there, at that time the most northern surveyed township was forty miles north of Winnipeg. So that there is no reason why it could not be cleared there. There is no doubt there are a good many muskegs capable of being drained, but until those are drained and the country cleared, it will be subject to summer frosts. A great many parts of Old Ontario were the same until the country was cleared. I believe there are men here, even some of those who are becoming gray, who will live to see that clay belt equal to any part of Old Ontario. (Applause.)

Mr. Anderson—Since this thing has come so far, I would wish to see it go as far as this Association sees fit to put it. If I am in order, I would make a motion that that portion of your paper that affects this topic be printed in the press in as public a manner as possible with the authority of the Association. (The motion was seconded by Mr. E. D. Bolton, and carried.)

(This Association is not responsible as a body for the opinions expressed in its papers by Authors.)

GOLD MINING IN THE YUKON.

BY E. D. BOLTON.

In about the year 1885 placer gold was discovered by white men in what is known as the Forty Mile country, situated near the boundary line between Canada and Alaska. On account of this discovery being made in 1887, William Ogilvie was sent to the Yukon by the Canadian Government to begin the work of locating the 141st meridian, it being the established boundary between Canada and Alaska. The head waters of the Forty Mile River rise in Alaska and flow through Canadian territory for about 30 miles before joining the Yukon River. It was, therefore, necessary to ascertain where the boundary line ran through the gold-bearing fields to prevent clashes of authority between the two countries. Although Mr. Ogilvie had to abandon most of the proper but heavy appliances for astronomical observations, he adapted local aids so well and did his work so thoroughly that his line was accepted by the United States authorities for twenty years. The observations made in 1907 by two clever young astronomers, McDiarmid and Jacques, of the Dominion Observatory, showed that his line was only a few hundred feet out and in Canada's favor. Mr. Ogilvie was doing this fine work with a small instrument clamped on a tree stump clinging to a slope which persisted in shifting slightly with varying temperatures. Many of the observations were taken at night in a temperature of from 20 to 55 degrees below zero, and when after two hours of tense and motionless work alternately watching stars chase each other across the wires of his telescope and the flying seconds hand of his chronometer, his own hands were usually paralyzed with cold; also he had only one chronometer beating five ticks to the second and each tick meaning 1,000 feet, and with other crude appliances and remoteness from telegraph communication twenty-five years ago, we can form some idea of the wonderful accuracy of his observations and calculations. In 1895 Mr. Ogilvie was again sent to the Yukon to continue his international line, and remained in the country until 1897, returning to civilization on the opening of navigation. When Robert Henderson of Pictou, Nova Scotia, followed his discovery of gold in creeks in the Indian River Valley in 1894 and 1895 by a richer discovery on Gold Bottom, a tributary of Hunker Creek, in the Klondyke valley,

in June and July, 1896, a stampede followed, and, as Mr. Ogilvie says, there were parties of miners scouring the country in August looking for the new find. The Carmac "Skookum Jim" and Cultis Charlie party went there to stake by Henderson's invitation to the white man, George W. Carmac. On their return, which was across country, Skookum Jim stumbled on a find of coarse gold on what is now Bonanza Creek. Almost simultaneously a party of miners headed by Edward Monahan, in crossing Bonanza Creek on their way to Henderson's, also found coarse gold, some miles below the others. In ignorance of the other discovery, they staked there, and some time later, at a meeting of 25 miners who had come from all parts hunting for Henderson's discovery, named the creek Bonanza and its tributary Eldorado, and decided to re-measure the claims with a rope which had been shortened by about ten feet by one of the party. Claim jumping followed, and when in the autumn some holes had been sunk to bedrock, about 30 feet, and the real riches of Bonanza began to be apparent, trouble and bloodshed was in sight, as a majority of the miners were from the Western States and were not used to Canadian law and order. The N. W. M. Police were still about 70 miles away, at Forty Mile, and were few in number. Mr. Ogilvie had gone up to the Dawson townsite to lay it out, and some miners remembered that here was the man who had surveyed their claims along the international boundary. Petitions containing 130 names were handed to him, asking him to survey the creek. This work he did free of charge through the dead of an arctic winter. He was warned that he might be shot if he attempted to trespass on the claims of some claim jumpers, but the bad men were soon won over by this genial man, who was doing his work with absolute impartiality and honesty His decisions were accepted without dispute and no funerals followed, although he surveyed his temporary host off his jumped claim. Had he not been absolutely fair and honest, he had many chances to have held very rich ground during the progress of the survey. This was particularly so in the case of the Dick Lowe fraction of 86 feet near Discovery, on Bonanza Creek, which produced over $400,000 in gold dust. Mr. Ogilvie became aware of this fraction while surveying near Discovery and, fully aware of the richness of the claims on either side, he would not stake it himself and did not give any information to Lowe, who was working for him at the time and sought his advice as to staking it. Lowe had to leave the service before he could stake the claim. In 1897-1898 it is estimated that about 40,000 people passed inwards to the Klondyke region. In the spring of 1897 Thomas Fawcett, D.T.S., of Ottawa, was appointed the first Gold Commissioner of the Yukon country and, together with a party, started for the Yukon the first week in May

and landed in Dawson with R. B. Craig about the middle of June, the two men having made the trip down the river in a 17-foot Peterborough canoe. In going through the Miles Canyon their canoe struck the rocky side, but the force of the blow was broken by a paddle. The remaining distance was made with one man lying on his back in the bottom of the canoe. The Miles Canyon, the White Horse Rapids and the Five Fingers are the only dangerous rapids along the route, although the river has a strong current and one has to be continually on the watch. The writer, together with James Gibbons, D.L.S., made the trip down the river in a 16-foot canoe. We made the distance between the White River and the Stewart in forty minutes, it being about 12 miles, and neither of us could swim. Dawson is situated on the bank of the Yukon River at its junction with the Klondyke River, and in a muskeg, moss, black muck, and small spruce on the top and gravel on the bottom. When later on the town became drained the conditions were much improved.

The mining laws in force in the Yukon were not exceptionally good and many lawsuits took place. The creek claims were first 500 feet long, and from rim to rim rock, the Discovery claim being 1,000. Bench claims were 100 feet square. Then Creek claims were changed to 250 feet, hillside claims were 250 feet by 1,000 feet, and bench claims changed to 250 feet square. In 1897 a systematic survey of the most important creeks was started and continued from time to time. A base line was run up the general direction of the valley, and then the boundaries of the hillside claims were drawn at right angles to the different courses of this base line. This worked a great hardship in many cases, as many of the hillside claims, being staked before at different angles, were cut out of their workings. These conditions happened on a number of creeks. The larger and most important creeks of the district are Bonanza, Eldorado, Dominion, Hunker and Sulphur. The richest spot in the country was around and about the junction of Bonanza and Eldorado Creeks. Many 100-foot square claims were staked on Gold Hill at this junction, and some of these produced over $50,000 in gold, and a greater portion of it being taken out with a rocker or Long Tom. The average depth to bedrock on the creek claims is about 30 feet, varying from only a few feet to over 60. The hillside or bench claims varied as to their location on the slope of the hill. Those situated near the rim rock were shallow, and farther up the hillside they increased in depth. Most of the hillside claims being worked from a tunnel. Some bench claims on Hunker Creek were over 100 feet to bedrock, being in gravel the whole depth. One hole would be through frozen ground, and perhaps 15 feet

away the ground would not be frozen. Where the surface of the ground is protected by timber or moss it is frozen underneath, and in spots where it is gravel to the surface it is not frozen. I have seen some holes put down over 100 feet and not a bit of frost. Some of the shallower creek claims were worked from the surface, the top soil and lighter gravel being ground sluiced off and then shoveled into the sluice boxes, often using horses and scrapers and other machinery. Wood fires were first used to thaw the frozen ground, then steam was used, steam generated in a boiler (often about the size of a tea kettle) was piped to the proper place, the steam point was made of steel, hollow and pointed at the end, with a solid piece at the back for driving in; rubber hose was used and an arrangement in the shape of a tee with a valve or valves attached to turn the steam off and on; then the steam being turned into this point, it is driven into the frozen ground, and after being thawed is left for some hours before being taken out. Hoisting was at first done by hand and then hoisting machinery was used.

Many pumping plants were erected in the Yukon to pump water for hydraulic purposes and also to work hillside ground, and the writer does not know of one that has ever made any money. There were five or six large companies formed who erected pumping plants. The Andrews Company, on Bonanza Creek, spent upwards of $250,000 in erecting their plant and buying partly worked out ground, and when they were ready to do business they found they did not have enough water; also the ground not being rich enough on account of too much waste dirt to handle. This plant used 20 cords of wood per day at a cost of $10 per cord.

Dredging in the Yukon River near the mouth of Sixty Mile Creek, above Dawson, was in progress in 1897 when we went into the country, two dredges being built of the one pattern by a California company, the other being in operation in that State. The one used in the Yukon could not make it pay, as the gold was too fine and hard to save. This dredge, in 1899, was brought down to Dawson and taken up to 49 below on Bonanza Creek, where the company operated on a 50 per cent. basis, the next year being increased to 60 per cent.; this was a paying concern. The machine could be worked by three or four men and handled 2,000 yards of dirt in 24 hours. When they ran into frozen ground an ordinary well-drilling machine was used and then explosives were used and the ground blasted along the edge of the pool. This caused the water to rush in and thaw the frozen ground in a few hours. The Gugenheim Syndicate have now placed a dredging machine in the Klondyke valley costing about $400,000. This dredge will handle 9 cubic yards of dirt to each bucket. The company also use steam

points for thawing ground, they being 17 feet long. The company have a dam across the headwaters of the Klondyke River and bring water down in flumes and ditches, and are extensively working on Bonanza and other creeks. They also have an electrical plant on Indian River and use the power for pumping and for power. The snowfall and rainfall in the Yukon is not heavy, and for this reason gold mining is more difficult. In the early days of the country, before much machinery was used, the pay dirt was taken out in the winter and washed out in the spring, the miners working night and day while the water lasted. The most of the wash-up being done in about three weeks, in May and June, at this time of the year there being 24 hours daylight.

Coal and ivory are also found in this part of Canada and copper in the White Horse region. Many bones and tusks of prehistoric ages are also found. At the mouth of a small gulch on Bonanza Creek almost a complete skeleton was found, but could only be taken out in pieces, as the ground was frozen. The rib bones were about 14 feet long and the spine about three inches in diameter. The teeth are about the size of a man's head. Two tusks were placed at the door of a road house on Bonanza Creek which weighed about 800 pounds.

The gold dust from the different creeks varied in value, coarse gold always being worth more per ounce than fine gold. Dust from Bear Creek averaged about $14.00 per ounce, Bonanza Creek $15.50 to $16.00, and some Dominion Creek dust went $18.00. Some dust from the Forty Mile region went as high as $19.40, this being the highest found. The banks doing business in the Yukon certainly reaped a rich harvest, and the rake-off, or whatever you may call it, must indeed have been great. When an old sour-dough went into the bank he gave up his sack to the man behind the wicket, who immediately dumps the dust into a blower, shakes it around a few times, and after stirring it with a magnet and looking wise for about ten minutes, then proceeds to weigh it. After certain deductions the poor miner gets the equivalent in cheechaco money or coin of the realm and goes his way. Commercial dust, or that in circulation every day, was taken at $16.00 per ounce, and afterwards reduced to $15.00. A great deal of the dust after coming from the mines was adulterated with black sand after getting into circulation. Many stories are told of the richness of this country and of hardships and good and bad luck. A true story is told about a claim on Eldorado Creek. After the creek was staked no one knew of its riches, as no holes had been put down to the bedrock. Some miners, one of whom owned one of these claims, thought to put up a job on Charlie Anderson. They first got Charlie drunk

and then sold him this claim for $100. In the morning he woke up, and in looking through his pockets he found part of his money gone and a bill of sale for this claim. Charlie thought, of course, that he had been cheated. However, he said, "I go sink a hole," which he did, and on reaching bedrock struck it rich, and he was the happiest Swede out of jail. This claim produced in gold dust about $250,000.

A great deal of credit is due the N. W. M. Police, who were sent into this region under many difficulties, Captain Constantine being in command at this time. For the first year they were on half rations and took many perilous trips across country in the dead of winter. The Gold Commissioner's staff were also on half rations, pay streak bacon, beans and bread being the order of the day. In the winter of 1897-1898 provisions were scarce, as some of the lower river boats did not arrive at Dawson, but were stranded down the river. Some of the prices were: Coal oil, $10.00 per gallon; flour, $100 for a 50-pound sack; candles, 25 cents apiece; sugar, $1 a pound; and a few other articles in the same proportion.

The Yukon country abounds in caribou and moose and other small game. Salmon come up the river as far as Dawson, but the season here is short, and the fish are about played out after their long journey of 2,000 miles. Wild fruit is found in abundance, raspberries, blueberries, wild currants, and cranberries being the most abundant.

In closing I beg leave to say that I have just learned that the completion of the location of the international boundary along the 141st parallel is about to be completed this summer. There is about 30 miles yet to be run in the vicinity of Mount St. Elias. This mountain peak is over 15,000 feet high, and has only been reached once by white man, it being accomplished by the Duke of Abruzzi some five years ago. Two parties are being sent out by our Government, and also parties by the American Government, and it will be a race for who gets to the top first, but I think the Canadian party will win.

Discussion.

The President—This paper is now open for discussion, Gentlemen, and it is a very valuable one.

Mr. Whitson—Is there any placer mining up there yet?

Mr. Bolton—Quite a bit; it is all being worked by machinery now.

Mr. Dobie—Mr. President and Gentlemen: I am sure we have all listened with a great deal of pleasure to Mr. Bolton's paper, and have derived considerable instruction and profit therefrom. I have much pleasure in moving that this paper be accepted and a vote of thanks be extended to the writer for the conscientious care he has expended in preparing the same.

(On the motion being seconded by Mr. Wilkie, the same was carried, with applause.)

(This Association is not responsible as a body for the opinions expressed in its Papers by Authors.)

FORESTRY IN ONTARIO.

BY E. J. ZAVITZ.

The Province of Ontario must always be deeply interested in forestry. Over 50 per cent. of her land surface is unadapted to the growing of agricultural crops and this area can best be utilized by keeping it under forest management for all time to come.

The development of a forest policy in any country must come gradually as economic conditions warrant changes and innovations. What may be possible in one country to-day may be utterly impracticable in another. The necessity of protecting watersheds, the increase in stumpage values, the possibility of utilizing inferior classes of goods, gradually tend towards more intensive methods in managing forest properties. In Germany, 150 years ago the forest conditions were much the same as we find in Ontario to-day—large areas culled, slashed or burned! and one writer in 1778 states of Prussia that "not a single acre could be found in the province that had not been burnt in earlier or later times."

In discussing this question it will be of interest to note the stages in development through which most countries pass in regard to their forest resources.

For the Indian, who originally inhabited this land, the forest had its chief value as a hunting ground. The same was true of our ancestors in Europe, for we read of the forest of William the Conquerer, which were largely used for the protection of game and the chase.

A second stage came when our forefathers arrived in this country and found the forest an impenetrable barrier against the growing of food crops. Wood in those days had no value, and magnificent timber had to be burned to clear the soil for agriculture. Traces of the prodigal use of wood in those days are still to be found in the old walnut fence rail and the splendid squared cork pine in structural parts of old buildings.

A third stage was reached when industrial development made wood supplies an object of commerce. Then came the lumberman who exploited the forest without regard for the future, and he was often followed by wind and fire to finish the desolation. It is just

as useless to criticize the development of this period as to lament over the magnificent timber destroyed in early agricultural settlement. The men of those days worked against great odds and the forest supplies were thought to be inexhaustible. Ontario has passed through this period, and many of you older men are familiar with the square timber camp with its waste, and with the logging camp which took out only the choicest of logs. You will also recall the annual fires which swept the country, the history of which was outlined to you by Mr. Whitson in 1908, at your annual meeting.

The fourth stage arrives when the people of a country realize that the timber resources are becoming depleted. Then comes attempts at conservative lumbering, fire protection, withdrawal of land from settlement, applying diameter limits in cutting, and attempts at tree planting or reforesting. This stage has existed in Ontario for some time, and I will refer briefly to the outstanding features of the development.

We find writers in the '80's in Ontario predicting exhaustion of our timber supplies and in most cases they were ridiculed. To-day we frequently hear of the time when a timber famine will strike us. Some prophets have arrived at the exact year in which this great calamity is to come upon us. If a timber famine means high prices and restricted uses of wood, we have reached it several years ago. What is really happening is, that our virgin timber is disappearing, and we are cutting and utilizing material which would not have been looked at a few years ago. It is estimated that in Ontario the Crown still has ten to twelve billion feet of pine, besides several billion feet still existing on licensed land. This amount of virgin pine in Ontario represents just about the annual cut of soft woods in the United States. Much of this virgin pine is from 150 to 350 years of age, and represents a class of timber which will never be reproduced in this country.

That we will gradually be restricted in our use of wood is evidenced on all sides to-day. Watch the class of logs which are being put on the skidway and sent down to the mills—small diameter logs full of knots, defective butts, all sorts of stuff that a few years ago would have been left in the woods to burn. Note the prices being paid for the much despised poplar and balsam. I find that at Gooderham, in Haliburton, on the I. B. & O. Railway, peeled poplar sells for $3.75 per cord and balsam $4.50 per cord. More remarkable, however, is the fact that it is shipped all the way to the mill at Johnsonburg, Pennsylvania. Also in Haliburton, a mill was found manufacturing nail kegs and similar articles out of 6 to 8 inch poplar, which was brought in by the farmers of the district.

It is also interesting to note that about one-third of the forest revenue ($500,000.00) in Ontario last year was obtained from the small diameter class, namely, the railroad tie.

I would not be surprised to find that on some of these cut-over areas better revenue might be derived to-day, than was obtained for the virgin pine years ago, when stumpage values were very low, and the profits in manufacturing lumber small.

Instead of the so-called timber famine, we will be utilizing stumpage that was of no value a few years ago. The possibility of using the poorer classes of timber will gradually make it possible to introduce methods of protection and management not practicable in the past.

Fire protection in an unorganized forest country is one of the first and most serious problems. Ontario took the lead in solving this question in 1884, when Mr. Aubrey White recommended the adoption of a fire ranging system. This system, which is based upon an organized patrol, cost the province a little under $4,000.00 in the year of 1885, with about thirty-seven men in the field. It is interesting to note that this organization has developed so that last year there were about nine hundred men in the field (including rangers on Crown lands and licensed lands), at a cost of a little over $300,000.00.

Another development which came during this fourth stage was the withdrawal of land from settlement. The Forest Reserves Act of 1898, in Ontario, empowered the Lieutenant-Governor-in-Council to set apart special areas as permanent forest lands. The reserves set apart under this act are:—

The Temagami Forest Reserve, containing.....	5,900	sq. miles
The Mississaga Forest Reserve, containing	3,000	"
The Nepigon Forest Reserve, containing.....	7,300	"
The Eastern Forest Reserve, containing	100	"
The Quetico Forest Reserve, containing	1,560	"
The Sibley Forest Reserve, containing	70	"
The Algonquin National Park, containing	1,930	"
A total of	19,860	"

The policy involved in the above Act will have a far-reaching effect upon forestry development in Ontario, because it should insure to the province the future title to these absolute forest lands.

To have some vision of what these lands will eventually mean to Ontario look at the following:—Saxony, with 500,000 acres of state forests, yields an annual net revenue of about $6.00 per acre. Saxony during the last 50 years has taken some 200 million dollars from her small forest property, and that without impairing its producing value.

One method of trying to protect the forest for future crops is the regulation of the diameter limit below which no trees may be cut. This may in some cases be of benefit, but cannot be applied in a general manner. In many cases, in even aged stands of timber, there will not be enough trees left below the regulation diameter to insure a proper seeding of the area for new growth. Again the cut might be so heavy that the remaining timber would be subject to windfall. Cases might arise where it would be advisable to cut below the accepted diameter limit where dense stands are encountered. If the future crop is to be protected, the method of cutting must be judged on the spot, and it will be dangerous to depend entirely on the diameter limit regulation.

Other movements which have come during the formative period have been attempts to encourage tree planting and to encourage the better care of woodland on private holdings. In 1883, an act was passed whereby tree planting was bonused. In 1896, the bonus was abolished, as only about $4,000.00 had been used out of the grant of $50,000.00. Another form of bonus was enacted in 1907, whereby the municipality was empowered to withdraw from taxes a percentage of each owners' holdings if it complied with certain forest conditions. Up to the present time no advantage has been taken of this act, so that it will accomplish little. The bonus system of encouraging tree planting has been tried in many states and has been a failure in getting results.

The southern, older part of Ontario presents a problem somewhat different from that of the unorganized north country. This more densely populated agricultural region is composed largely of private holdings. The woodlands have gradually disappeared until we now have about 9 per cent. of depleted woodland left, with many townships only containing 5 to 6 per cent. The over clearance in this region has long been a matter of serious concern.

It is useless to urge the reforesting of good agricultural land, but there exists in older Ontario two classes of soil which can only be utilized for the growing of forest crops. These are: First, waste portions of the farm, as steep hillsides and light sandy or gravelly spots; and, second, the larger contiguous areas of non-agricultural soils which exist in many parts of older Ontario.

It is estimated that there is in the old settled portion of Ontario an aggregate of about 8,500 square miles of farmers' woodlands. There is probably, in addition to the assessed woodlands, another area of 8,500 square miles which is suited only for forest growth.

It is the policy of the government to assist and encourage the private landowners to properly manage their woodlands and to reforest the waste portions of their lands. To carry out this assistance the government furnishes planting material and instructions as to methods, while the owner must prepare the soil, plant and care for the trees.

The work of tree distribution was started in 1906. One and a half million trees have been distributed, going into forty-two counties. The plantations are usually from one to several acres in extent, and are located upon waste types of soil, such as sand formations.

Another line of work, undertaken by the government in 1909, is an experiment in reforesting on a larger scale. This work is being carried on in Norfolk County, where a large contiguous area of sand formation exists. This forest station contains 1,500 acres, with the possibility of increasing it to two or three thousand acres in one contiguous block. The government forest nurseries are located at this station for the production of plants to distribute to private owners throughout the province and for use in planting locally. The area at this station contains second growth pine, scrub oak lands, abandoned fields, and blow sand formations, thus affording a variety of conditions with which to deal in an experimental way.

Time will not allow me to describe the methods of reforesting from the production of the nursery stock to the final planting on waste land. I would like, however, to emphasize that we are planting pine at a cost low enough to make it a safe investment. We know the cost of planting, the approximate growth of pine on the areas we are planting, and at present stumpage values we are on the safe side.

While I am certain that this work in southern Ontario can be done as a safe economic proposition, do not understand that I would advocate reforesting on a large scale throughout northern Ontario. With our present organization and conditions, protection is our greatest problem. Artificial reforesting, on areas where desirable young growth will not come, is a problem of the future, and our experiences of an experimental nature in southern Ontario will

place the government in a position to intelligently approach this larger problem when the time comes.

The final stage in the development of a forestry policy is reached when the forest areas of the country are organized for permanent management in order to give a sustained yield in perpetuity. This policy involves: First, the examination and mapping of the forest area, so as to ascertain the character of the property. A working plan is then made and the possible annual cut is determined so that continuous crops may be assured. The cutting is always done with a view of securing a new crop. This is done in various ways—in some cases the mature trees are removed along with the weed trees, and the desired young growth is always favored. Or else the area is cut clear and replanted, a method common in the Prussian forests. The forest becomes a permanent organization with roads and trails, telephones and a trained staff of men.

In finishing I would like to predict what the future holds in store for this province with its large area of permanent forest land. I might make estimates as to what the future acreage will be with its yield per acre and the possible revenues, but this would be merely a guess. We can form some conception of the future when we realize that in Prussia in 1830 (where forest conditions and economic conditions were perhaps less favorable than with us at present) the forest produced less than 200 board feet per acre per year, giving the state 44c per acre net revenue. In 1907, this annual production reached 427 board feet per year, giving a net revenue of $2.52 per acre. No doubt history will repeat itself and Ontario will always have a magnificent resourse in its permanent forest lands.

Discussion.

The President—I am sure, Gentlemen, we are all very much indebted to Professor Zavitz for his very excellent paper. I don't know of any more important subject that can be brought before the surveyors of Ontario than this subject that we have had, and he has handled it in a very masterly way. It is now open for discussion, Gentlemen, and we will be glad to hear what you have to say on it.

Mr. Kirkpatrick—I would move that Professor Zavitz's paper be printed in the proceedings, and a cordial vote of thanks be given to him for his very lucid lecture that he has given us on the subject. There is no doubt about it, if we had only known of it fifty

years ago, things would have been very different. I can remember, myself, it is not quite fifty years ago, when I was serving my time I used to see square timber cut that averaged six feet at the butt, and after cutting down the tree and making one square timber they would leave four logs of the pure stuff to rot, because they said they were not in the business of taking out logs, at that time, and consequently it was left there to rot.

Mr. Code—I have much pleasure in seconding that, Mr. President.

The President put the motion, which, on a vote having been taken, was declared carried.

The President—I have much pleasure in conveying to you, Professor Zavitz, the thanks of this Association for the address you have given us.

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SURVEYING NINE MILE TOWNSHIPS IN NORTHERN ONTARIO.

H. J. BEATTY, O.L.S.

The purpose of this paper is to make a few references to the subdivision of nine mile townships as now surveyed in Northern Ontario in the hope that some suggestions may be received that will be of benefit not only to the surveyor but also to the public.

Under this system the townships are divided into sections of eighteen hundred acres or thereabouts, the blocks being one hundred and twenty chains in depth between centre lines of concession road allowances and one hundred and fifty-two chains and fifty links between centre lines of side road allowances with twelve lots of one hundred and fifty acres in each of the regular blocks, lots being twenty-five chains and twenty-five links wide, there being an odd-sized block along the west boundary of every township in which the last lot has a width of thirty-five chains or thereabouts, lines being run in the centre of road allowances and posts planted by offsets to the front corners of the lots, the rear line of lots not being run.

The planting of these posts is a matter of much importance because under the Survey Act in the absence of a lot post for lot in one concession the post opposite will be the one that governs, and surveyors are particularly warned to plant them accurately. This can best be done with a transit, but it too often happens that when the lines are being run the chainmen are not up to the transit gang, hence the surveyor has to rely on them for location of posts.

One method is to provide chainmen with a small compass on which there is an extra pair of folding sights placed at right angles to the others. The posting of one of these townships forms a very considerable portion of the total cost of survey, and while there is no room for doubt as to what is required in regular lots, there has been a difference in the method of posting of lots where lines are broken by lakes and rivers along the shores of which there are road allowances, some surveyors planting posts on the centre line only at a distance of sixty-six feet from high water mark, and others planting posts for the intersection of the sides of the concession on side road allowances as well. It does not appear to me to be necessary to plant any posts except for the lot corners. Plan and field notes

will show whether there is a road allowance along a body of water or not, and this is what will really govern later on.

Just here I would like to suggest that we should erect a more durable monument at the intersection of side and concession road allowances than the wooden post and bearing tree; that an iron post be planted at the north-east corner of every block excepting on the south and west boundaries of the townships. On the blocks along the south boundary place iron post at the south-east corner and on the west boundary place it at the north-west corner of the block. By this we would have a post, that fire would not destroy, to locate the corner of every block, and by having iron post planted at the block corner it would not be so liable to be lost as if planted at the intersection of centre lines of road allowances. Wooden posts and bearing trees are not sufficiently permanent monuments, and the extra cost of planting iron posts, as above suggested, would be fully justified by results.

The question of cost will naturally arouse the interest of members, and I humbly submit that a more equitable method should be devised of paying for the subdivision of townships.

At present it is a certain rate per acre over the whole area of the Township. This would be all right if the same labor were necessary for each township, but many townships are broken by lakes and rivers and some cut up by railroads. The traversing of these and posting of lots fronting or abutting on them necessitates, in many cases, a great amount of extra labor, and I submit that a schedule of prices based on that adopted by the Dominion Government for work in the Western Provinces would work out more equitably to both the surveyor and the Government. It does not seem reasonable that one surveyor may have to run many miles of transverse lines and plant dozens of extra posts and not get any greater recompense than the surveyor in an adjoining township where the work is not delayed by the necessity of making any traverses whatever.

Some have held that townships with lakes and rivers running through them are more cheaply surveyed owing to the transportation facilities being so much better than in the ones without them, but such is not my experience. The delay caused by planting posts, getting across rivers and around lakes more than offsets the advantage of the moving of men and supplies.

I have subdivided townships with many lakes and rivers and others without them, and there is no doubt as to which work was the more economically performed.

We are continually running across cases where the plans of townships broken by water are very inaccurate, and I believe that if the surveyors had been paid for traversing lakes and streams we would not have such cause for complaint now. Accuracy should be of the first importance, and the way to get accurate work is to pay for it.

Now with reference to the reports, field notes, etc., to the Department, any field notes I have seen return the bearing of side lines as having been run north astronomically and of the concession lines as being west astronomically. Of these the bearing of the side lines is of the most importance, that being the bearing on which the side lines of the lots are to be run, and it seems to me we should return the actual bearing of each line as near as is practicable, and show in our returns how this bearing was obtained; if by observation, where it was taken, and whether by turning off, deflecting from, or by producing a line. This would necessitate some changes in the method of making returns, such as recording notes in the exact order and manner in which lines were run on the ground. I have not had much experience on surveys in the Northwest, but such as it has been convinces we that there are many features of their system of making returns and of paying for the work that could be adopted with profit to us in Ontario.

The surveyor is supposed to report on land, minerals, timber, water powers, etc., and I think these are of so much importance that provision should be made for special reports by men sent out by the Department for that purpose. While the surveyor can report on the land generally, he certainly cannot afford the time to make a report on the minerals, timber or water powers that will be of much value to the public. I have heard criticisms of surveyors' reports on the above matters that were anything but complimentary.

Some remarks as to the manner in which surveyors who have been engaged on subdivisions of nine mile townships have proceeded with their work should be of benefit to others who may have work of this nature to perform.

My own experience was confined to one summer, when I subdivided two townships, one being north of the other. I divided my party into two separate camps of eight members each and, starting from the south boundary of the first township, one party moved up the side line between lots six and seven and the other moved up the side line between lots eighteen and nineteen, the party on the east running the concession lines over in time for the others to pick them up and produce them, the men in charge keeping in touch

with one another and dividing the work up as evenly as possible. The survey was proceeded with and camps were moved only along these lines, the result being a minimum of labor lost in moving camp and a satisfactory season's work. But these townships were practically unbroken by lakes or streams that would interfere with the work, and doubtless this method of procedure would not work out in all cases.

Discussion.

Mr. Beatty—One thing I would like to emphasize, and that is the matter of paying for surveys. At present, we get so much an acre. Now, take the case where a township is cut up by a lake or river or railroad, and you have to traverse that and plant posts on each side of the right of way of the railroad, and you have to traverse the lakes and rivers. It seems to me it is quite reasonable that there should be some compensation made per mile for making those traverses; and if we could go on and be paid for the survey of the township in the same way, just make it so much per mile of line run, the result to me would be more satisfactory.

We often hear criticisms made of the reports that are brought down from New Ontario. We are asked, in our instructions, to make a report on the soil, timber, mineral, water powers, and anything similar to that. Now, it seems to me it is not altogether reasonable to expect a surveyor to make a report on a water power which would be of any practical value. The report of a water power necessitates an extensive survey, not merely the calculation of the cubic feet flow per minute or per second; but you have to take into consideration the watershed and storage facilities and all that sort of thing—a report that in many cases is worth hundreds and sometimes thousands of dollars, to be of any practical use. Now, I think the surveyors should not be expected to give a horse-power report on any falls that come within the limits of their survey. If we find a fall on which there appears to be a chance of developing a water power in the future we could state so in general terms. In addition to that, there is the question of the timber. We can only give a general idea of the timber, that is, of its value. It appears to me that the Department with advantage could send along a man into every township that is subdivided, and have him make an accurate report of the amount of available timber, and that would rather relieve us of making anything except general remarks, as has been our custom in the past. I see Mr. Fitzgerald here, and Mr. Hutcheon, both of whom have had considerable experience, of course, in the subdivision of

nine-mile townships, and I would like to have some remarks from them.

In addition, I might say there is one thing that might be proved of use to the surveyor, and that is the method of proceeding with the work. Take the case of a regular township, where you have an opportunity of entering on the south boundary, as it is the most convenient place to start the survey; my system of proceedings was this: I put in two parties. One started at one corner and the other at the other corner, and they worked north through the township, and the camps were moved along those side-lines. The man on the east kept feeding the man on the west. As he got behind, and the other fellow got ahead, he could come over and pick up some of the sections of the line; and if two surveyors were working together, and one had the township north of the other, you could proceed north through the next township, and you get the minimum of packing and the maximum of efficiency out of your men. We employed small parties, with from seven to eight men in each. There are so many different forms of townships, and the facilities for reaching them are so variable, that you could not make a hard-and-fast rule of how to go about it.

The President—I am sure, Gentlemen, we have had a very interesting paper, and it ought to create a very useful discussion, and it is open now, Gentlemen, for you to take part in it.

Mr. Fitzgerald—I have listened with a good deal of pleasure to Mr. Beatty's paper. I don't think I can add much to it. Of course we all know when the Government gives its work out at so much an acre there are certain conditions attached to that. All the lakes are supposed to be traversed, and this makes the payment for the surveying of these townships not equitable. Sometimes there is a great deal more water in townships than in others, and I agree with Mr. Beatty there is no advantage at all in water; I would rather survey a township without any water at all. I think there should be monuments placed at each intersection, and it is probably better where Mr. Beatty puts them, at the northwest corners of the lots. He used the word—I don't know whether I ever saw it in Webster or not—about fudging in the lakes. As long as the traverse work is put in a lump sum with the acreage, I don't think it will ever be done properly. Mr Hutcheon here has had a good deal of experience in that kind of work.

Mr. Hutcheon—Gentlemen: I have done a little surveying, but I have not followed the old routine of late. When I first went out I thought the only way to subdivide a township was to have a fixed camp, do all within reach, and move and knock off the whole

gang. I began to think afterwards it was too hard work walking back so much, and I adopted the method followed by ordinary outline work. I now move along one line and cut the sidelines. I have work to do on two townships now, and I am perfectly satisfied with it. They were both situated so that I could start my work near the west side. Last year I had a subdivision with the railway crossing it, say at Groundhog River—(makes plan). I put my supplies and cache at the railway and brought a quantity with me down to the southernmost line. I went along the south boundary and started at the first side line north between 24 and 25, and went west, and moved along the concession line, and cut north and south till I reached this crossing. I cut back and forth throughout the township with one party only, and worked about five or six axes in one line, and in that way I am always up with my work, and I take an observation every clear night for direction. It may cost a little more. I don't know that it does cost much more to do a township that way than it does to have a fixed camp.

The President—The men are in better humor with less walking.

Mr. Hutcheon—We may run a whole day on sidelines. I sometimes put one or two of my packers to help the axemen, or put one of them to help the chainers to make posts. Sometimes they have hard work to bring supplies up, but I keep them employed as fully as possible, so that there will be no kick coming from the other men of the parties. Sometimes the chainers make the posts and sometimes I give them a man. The day they are cutting sidelines they have no posts to make, and they can always post an intersection along with the sideline. It has worked out all right. Most of the lines are on the true astronomic bearing. I limit myself as far as I can to an error of two minutes. I think probably there could be an improvement by using more iron posts. I am sure there would. When I wanted to find a post, when the post was gone, the bearing tree was also gone.

The President—You suggest putting iron posts and mounds and pits, like the Northwest?

Mr. Hutcheon—I have not thought much about the mounding. I have no doubt it would be more permanent. As to the traverse, I think probably it would be well to rearrange the payment for that matter; it is quite an undertaking to make a good traverse.

Mr. Dobie—I don't know that I am qualified to speak very authoritatively on this matter. I have had some experience, but possibly not as much as somebody else; still, every little helps. My idea as to the method of procedure practically agrees with that laid

down by Mr. Hutcheon. I have adopted practically the same method Mr. Hutcheon adopted, only he moved on concession lines. I think any surveyor will agree with me that the walking to and fro from work is the hardest part of the day's work. Last summer I used two parties and worked them both from one camp, and moved the camp every other day. I found, by having the side road run ahead of you, and packing up, and have every man take a pack after breakfast, we could make the whole thing in one trip. If you had an extra lot of supplies, you could send a man back to bring that up. I find it is a good thing to have a couple of extra men. Sometimes you have to put a man with the chain men; sometimes your chain men, if you get into heavy bush, will be able to keep up and post along with the party they are following, and at other times you will have to send a man along to help them out with the posting. I found it was a good idea at these intersections, supposing the chain men were following the concession lines, for them to drop off a man to make the posts, and leave the posts so that when they were ready for them they had them. That is the method that I have found to be easy, and the easiest on the man. The most economical way, I think of doing that work is not to attempt to do too much from one camp, and to move your camp as often as possible.

As regards Mr. Beatty's statement about traversing, I quite agree with that. I would far rather have a township without a lake or river or creek in it, as long as we can get enough for drinking water, because everybody knows they are an awful nuisance. If you have a lake running east and west, and your concession line south, and you have to post this whole lake, the only way you can make that traverse is to make an accurate measurement with your micrometer. You not only have to make the traverse, but calculate all your distances as you go along. Your man sets up pretty nearly where he thinks the corner is going to come, and you have to run an angle and measure, and it certainly takes a lot of time.

The system that the Dominion Government has of handling these traverses is to pay for the traverse separate altogether from the running of the line. The traverses are required to be made by transit and micrometer, or transit and stadia, and the notes properly recorded, and I think they are paid for at the rate of $11 a mile for the actual distance along the shore line of the traverse. I am quite sure that a system of that kind could be worked out that would be more satisfactory to the Deparment, because they could have accurate traverses made.

As regards the off-setting of the posts, of the sidelines posts from the concession, I used an instrument somewhat similar to

what Mr. Beatty mentioned. He mentioned having a compass with sights at the right angle. There is a little cross-head about three inches in diameter, and it comes in a little case, and it is arranged to set up on a Jacob's staff, and the chain men can carry that in a little bag, and it has two sights set at right-angles and two at 45 degrees from each other, with cross-wires on them. The way I did was to have the chainmen chain along till they came to a post, and instead of carrying a Jacob's post they made a little picket, and they would set this instrument up, and then, by looking through these sights, one chainman could stand at this little cross-head and hold the chain and the other go out, and, by planting a picket, I found they got it very accurately in that way. That instrument only costs $2.50, and you can't smash it, and I find that it gives very good satisfaction.

As regards Mr. Beatty's argument about the planting of posts along the rivers I am quite sure that the members who have had experience in these matters will agree with me that there are places where there are so many posts planted they are apt to be confusing.

As regards the planting of iron posts at the corners of blocks, I certainly think that is a good idea. It does not take very many posts; it would only take somewhere about 30 posts for the whole township, and I am quite sure that even if the Department did pay a little extra for the planting of those extra posts that the extra expense would be far more than compensated by the saving that would accrue in after years when these wooden posts are obliterated, as they are almost certain to be. At the present time the iron posts are planted in the centre of the road allowance, and when the roads are built through, the chances are that the posts are picked up and thrown to one side, and even if they are not, they are buried in the side of the road, and possibly a corduroy road built over them. When a surveyor comes along he has either got to tear up that road, or run the chance of not finding the posts. Mr. Beatty's suggestion is to have the posts off the road allowance altogether. In the Northwest, for instance, where the road allowance occurs, they make a mound. In the open prairie they plant iron posts, and put four pits around them, and scatter the earth. I think the labor of digging those mounds would be almost impossible, especially in heavily timbered country, and where it is low and swampy, I don't think you would need them at all in certain places. But iron posts would stay there for a very long time. I would like to see that, because I think the aim of this Association should be towards a higher standard of accuracy, and towards more permanency in regard to monuments.

Mr. Fitzgerald—With regard to the system Mr. Dobie adopted, of putting the posts in, I have improved on that. In the cross-staff I have a small spike in the bottom of it. I stick it into the top of the centre post. That obviates the necessity of carrying a Jacob's staff.

Mr. Beatty—Sometimes, in a township where there is a fair amount of water, it is not so bad; but you take a township that has an entire absence of water from the start, as far as you know, and afterwards you find a big lake up in the northwest part of the township, and you have to go after a canoe, I think it is somewhat difficult. I might say, for subdivision work and outline work, I use a folding canvas canoe, made by the Kalamazoo people, with steel ribs and heavy canvas. I have a twelve-foot canoe, and I have seen six men in it. It weighs about 55 pounds. and folds up into a bag. You can carry it lengthways on your back through the woods.

The only further reference to the method of surveying that I wish to make is, we have instructions to cut the lines out well—blaze them well. My idea with reference to that is, as far as cutting any lines is concerned, as long as you make it wide enough to get the line through the better line you have, because the more you open that line up the more underbrush grows up in it.

Mr. Dickson—Have a narrow line and well blazed.

Mr. Dobie—I think that is right, too. In running a transit myself I always carry a small axe with me; and when you see a tree your axeman has missed you can knock a chip off yourself. Would it be possible for the Department to prepare some kind of a manual on this system of surveying, setting out these points in more detail? I have found, in reading over the instructions, there are sometimes clauses that you can take two or three meanings out of. It is very difficult sometimes to determine just what is required, and every year each surveyor gets his instructions, and, on reading them over, you find about 90 per cent. of what is in one man's instructions is in the other man's instructions. It seems to me it might be of advantage to the surveyor, and a labor-saving device from the Department's standpoint, to have a printed manual to cover all these points more definitely and more in detail than they are at the present time.

The President—I think you will all agree with me that this discussion would not be complete until we hear from our good friends, Mr. Kirkpatrick and Mr. Rorke.

Mr. Kirkpatrick—I have listened with a good deal of attention and some of the recommendations I think are very good. I think that the system of planting one iron post at every corner is no doubt a practicable thing. I never did believe much in planting iron posts in the middle of the road allowance, because we all know that, in Northern Ontario, where they are six-mile townships, there are miles and miles, in which the colonization men build the roads and pull up the posts and throw them away. I put that down to stupidity on the part of the colonization road branch, because, when they pulled up the iron posts, they certainly ought to have stuck them 33 feet on one side, and not pitch them away.

As far as the question of paying for traverse of lakes, I don't know exactly how that will work out in practice, because there is not the slightest doubt in my mind that a nice river running through a township is a great help to the surveyor, and it is of far more use to him than another without a single lake or river near it.

As to this thing of packing, the trouble is, we project the township with no lakes or rivers in it, and it is a thing that the Department has no possible knowledge of, to know how that is to be done. I think possibly the Government might agree to pay so much a mile for the traverse. In one case you may get a heavily timbered township and a tremendous amount of timber around these lakes, and in another case it might be pretty open and very little to cut, and we would have to pay the same amount. We could not very well depend upon the Surveyor saying "I had a great deal of cutting in this timber, and very little trouble cutting the other." How we could arrange that I don't know exactly, except on a fixed mileage rate.

Mr. Rorke—Mr. Chairman: I do not think there is anything further I can say. There was one remark with reference to water power, in which Mr. Beatty said it was impossible for the surveyor to give an accurate estimate of that. I do not think it is altogether the intention of the Department that an accurate survey should be made, because, in a great many cases he is only on a small part of the watershed of that river, and he could not possibly make an accurate survey and give an accurate calculation of the water power at that point. It is not expected, but if he makes a traverse of the river I think that he should show where the falls and rapids are, and what the extent of them was, so that the Department can have something before them as a preliminary survey and report, so that they may deal with the matter in case application is made for that water power.

Mr. Russell—I would like to make one remark about moving posts off the road. I consider that is a very important point indeed, because I know where I come from the posts had been run off the road; but where there are certain inequalities the offset might be put 33 feet, and unless the surveyor knew that, he might run to the post, thinking it was in its original position, and thinking it was all right. If that is done they should have an iron bar put over about 33 feet, and have it marked on the one side "R.P." (reference post) on the side towards the road, showing the number of feet it has been offset. In that way we would have an easy reference at all times; but this ought to be done under instructions from the Surveying Department. They ought to instruct the overseer of the road.

Mr. Dobie—I move that this paper be received and printed in the proceedings.

Mr. Aylesworth—I understand that, in Ontario surveys, they are made by the acre. Some townships may have traversing in and some may not, so that the man who does not have traversing escapes all that, or the man who does have lakes has to make those traverses in addition to the others. It looks to me as if the Dominion survey is preferable in that respect, because there they are paid so much a mile according as it is prairie, brush, scrub, or otherwise. I understood the director to say he would have difficulty in saying whether it was prairie, scrub or brush. You have an Inspector to inspect these surveys, I presume, and they come along and check all this work up, so that the surveyor is one of the men that has to be honest. I think it is no more than right that subdividers should get paid for traverses. I second Mr. Dobie's resolution.

The President put the motion, which, on a vote having been taken, was declared carried.

O. L. S.
PRELIMINARY EXAMINATIONS
1913

CANADIAN HISTORY.

1. Give the names of five of the earliest French explorers in Canada.

2. What Indian tribes did Champlain encounter on his first trip to Canada?

3. Give the dates of the following events:
   (a) Treaty of Utrecht.
   (b) Surrender of Canada to England by the French.
   (c) Division of Canada into two provinces, Upper and Lower Canada.
   (d) Selection of York (now Toronto) as the site of the provincial capital.
   (e) Launching of the first steamboat in the St. Lawrence.
   (f) Commencement of the Rideau Canal.
   (g) Passing of the British North America Act.

4. What territory did England gain by the Treaty of Utrecht?

5. (a) What treaty closed the Seven Years' War? Give date.
   (b) Who was Governor of New France at this time?
   (c) What was the population of Canada at the time of this conquest, exclusive of Indians?

6. What Act in 1774 gave to the French the same political rights as the British?

7. (a) By what treaty and when did England acknowledge the independence of the United States?
   (b) Name two American generals who took an active part in the American War of Independence, in Canada.
   (c) Who was the Governor of Canada at the time of this War and who led the British in Canada?

8. When was the Constitutional Act passed and what did it establish?

9. By what treaty was the boundary defined between Canada West or Upper Canada and the United States as far west as the Lake of the Woods?

10. Give the names of the different Premiers of Canada since 1890.

11. Give the area of the Dominion of Canada and the Province of Ontario, also the population of each.

MENSURATION.

1. Define polygon, trapezoid, diagonal and obtuse angle.

2. Determine the hypotenuse from the given sides in a right angled triangle, one side being 20 ft. and the other 30 ft.

3. Give the rule for finding the area of a quadrilateral when the four sides and inclination of the diagonal are given.

4. Give the rule for finding the area of any irregular polygon, circle and sphere.

5. What is the divergence at the end of one mile between two lines, the angle between them being 5 degrees?

6. The sides of a triangular field are 10 chains, 12 chains and 14 chains respectively. Give the area in acres.

7. Two sides of a parallelogram are 10.62 chains and 15.35 chains. The angle between them is 30 degrees. Find the area in acres.

8. Lay out 200 acres in the form of a circle. Give rules for finding diameter and circumference.

9. Find the length of an arc of a circle whose diameter is 125 feet and number of degrees in arc is 54 degrees 36 minutes.

GEOGRAPHY.

1. Define astronomical, physical and political geography.

2. What degrees of latitude are comprised within the tropical, temperate and frigid zones?

3. Name the several countries, islands and waters crossed by the Equator.

4. Name the Provinces of the Dominion of Canada in order of area.

5. What is the largest river with drainage basin entirely within the Province of Ontario, and what is its approximate length?

6. Name the most southerly, northerly and easterly counties in Ontario and the county town of each.

7. Name the principal seaports on the Pacific Coast of the Western Hemisphere and the chief exports from each.

8. Where are the following mountain ranges: Andes, Pyrenees, Apennines, Kiolen, Atlas, Sierra, Nevada and Pindus?

9. What are the chief products of the following countries: Russia, Algeria, Cuba, Persia, Chile and Madagascar Island?

ALGEBRA.

1. Find the G. C. M. of $3x^4+4x^3-6x^2-12x-5$ and $3x^5-6x^4-18x^3+12x^2+39x+18$.

2. Find the L. C. M. of x^4-10x^2+9, $x^4+10x^3+20x^2-10x-21$ and $x^4+4x^3-22x^2-4x+21$.

3. Explain the meaning the following terms: Homogeneous expression, simple equation, quadratic equation, and simultaneous equation. Give one example of each.

(3b) Extract the square root of $(a-b)^4-4(a^2+b^2)(a-b)^2+4(a^4+b)^4-8a^2b^2$.

4. Solve $7(x+2a)^2+3a^2=5a(7x+23a)$.

5. The wages of 10 men and 8 boys amount to $22.30 per day. If 4 men together receive $3.40 more than 6 boys, find the wages of each man and boy.

(5a) Prove that a quadratic equation can have not more than two roots, and that a quadratic equation which has more than two roots is an identity.

6. A train travels 300 miles at a uniform rate. If the rate had been 5 miles an hour more the journey would have taken two hours less time. Find the rate of train per hour.

LOGARITHMS.

1. Show the relation between the Common and Napierian systems of logarithms.

(1a) Find Log._5 of 3125.

2. Find the value of $3.78956\times.053687\div007292$.

3. Find the cube root of .00001764.

4. The hypotenuse of a right angled triangle is 3.141024 and the one side is 2,593167. Find the other side.

(4a) Prove the rules for multiplying and dividing numbers by means of logarithms.

SPHERICAL TRIGONOMETRY.

1. Give Napier's rules for solving all right angled spherical triangles; draw the diagram explaining the "circular parts" and deduce therefrom ten equations.

2. Give rules (or formula) for solving spherical triangles when given: (a) the three sides, (b) two sides and included angle, and (c) two angles and included side.

3. In the right angled triangle given the hypotenuse c equals 110° 46′ 20″ and angle A equals 80° 10′ 30″. Solve the triangle.

4. Given the hypotenuse C equals 140°, the side a equals 20°. Solve the triangle.

5. Given A equals 132° 16′, B equals 139° 44′, b equals 127° 30′. Find a.

6. Given a equals 100°, be equals 50°, c equals 60°. Find A.

ENGLISH GRAMMAR.

1. What are the different kinds of pronouns? Give examples of each.

2. Your coat is black; mine is a white one. Name the pronouns in the above sentence and classify kind of each.

3. Define Mood, Voice, Auxiliary Verb.

4. Write down plural form of the following words: Wharf, colloquy, Mary, knight templar, step-son, bureau, oasis, medium, salmon.

5. What are hybrids? Mention any that are recognized as good English.

6. Why are Prepositions so called? Discuss the use of the Prepositions in the following sentences:

(a) The island of Anticosti lies in the Gulf of St. Lawrence.

(b) Do your duty by the school.

(c) No animal is larger than a whale.

7. Define Syntax, Verbiage, Ellipsis, Good English.

ARITHMETIC.

1. Define vulgar fractions; square and cube root.

2. Reduce each of the following fractions to its lowest terms:

$$\frac{114135}{2206661}\ ;\ \frac{128352}{238368}\ \text{and}\ \frac{55247}{74841}$$

3. Add together each of the following:

(a) $100\frac{2}{5}$, $64\frac{5}{9}$, $\frac{3}{5}$ of 701

(b) $387\frac{1}{2}$, $285\frac{1}{4}$, $394\frac{1}{3}$ and $\frac{2}{5}$ of 3704

4. Reduce the expression:

(a) $$\left(3\frac{1}{3}+\frac{2}{10\frac{1}{2}}-\frac{5}{18}\ \text{of}\ \frac{4}{7}\right)\times 1\frac{3}{4}$$

(b) Simplify the expression:

$$\frac{\frac{1}{2}+\frac{1}{3}+\frac{1}{4}}{\frac{1}{2\frac{1}{2}}+\frac{1}{3\frac{1}{2}}+\frac{1}{4\frac{1}{2}}}$$

5. Divide 816 by .0004; and .0019610652875 by 2.38645.

6. Multiply 417 and .417; 71956 and .000025.

7. (a) Find the square root of .042849; 00139876.

(b) Find the cube root of 32.461759; 001906624.

8. Between the years of 1851 and 1861 the population of the city of Toronto increased about 78 per cent., and in the latter year it was 444821. What was it in 1851?

9. A cistern is fed by a spout which can fill it in 2 hours. How long would it take to fill it if the cistern has a leak which would empty it in 10 hours?

GEOMETRY.

1. The angles at the base of an isosceles triangle are equal to one another, and if the equal sides be produced, the angles on the other side of the base shall also be equal to one another.

2. If two straight lines cut one another, the vertical or opposite angles shall be equal.

3. If a straight line, meeting two other straight lines, make the exterior angle equal to the interior and opposite angle on the same side of the line, or if it make the interior angles on the same side together equal to two right angles, the two straight lines shall be parallel to one another.

4. To describe a square on a given straight line.

5. If a straight line be divided into any two parts, the rectangle contained by the whole and one of the parts is equal to the square on that part, together with the rectangle contained by the two parts.

6. To divide a given straight line into two parts, so that the rectangle contained by the whole and one of the parts may be equal to the square on the other part.

7. The angle at the centre of a circle is double of the angle at the circumference on the same base, that is, on the same arc.

8. The opposite angles of any quadrilateral figure inscribed in a circle are together equal to two right angles.

9. In a circle the angle in a semi-circle is a right angle, but the angle in a segment greater than a semi-circle is less than a right angle, and the angle in a segment less than a semi-circle is greater than a right angle.

PLANE TRIGONOMETRY.

1. Define: (a) The sine, the tangent, the secant, the cosine, the cotangent and the cosecant of an angle.

(b) Prove that the sine and cosecant; the cosine and secant; and the tangent and cotangent are reciprocals of each other.

2. Express in circular measure correct to the 4th decimal place the following: $1°$; $3°\ 48'$; $12°\ 56'\ 24''$; $42°$; $65°\ 11'\ 02''$.

3. A train is running on a curve of half a mile radius. In 10 seconds the engine passes over 1/5 of a radian. Find the rate of the train.

4. Reduce to degrees:

$$\frac{\pi}{2}, \frac{3\pi}{2}, \frac{5\pi}{6}, \frac{7\pi}{8}, \frac{9\pi}{5}, \frac{13\pi}{18}$$

5. Prove the following:

$$\text{Sine } x = \frac{1}{\text{cosec } x} = \tan x \text{ Cos } x = \frac{\tan x}{\sec x} = \frac{\cos x}{\cot x} = \sqrt{1-\cos^2 x}$$

$$\text{Cos } x = \frac{1}{\sec x} = \text{Cot } x \text{ Sin } x = \frac{\text{Cot } x}{\text{Cosec } x} = \frac{\text{Sin } x}{\tan x} = \sqrt{1-\text{Sin}^2 x}$$

6. The sines and cosines of two angles being given, to find the sine and cosine of the sum and the sine and cosine of the difference of these angles.

7. Given b equals 15.1101, c equals 31.0005 and A equals 10° 15′. Find B and C.

8. Given a equals 10, b equals 12, c equals 14. Find the angles.

LINEAR DRAWING.

1. When it is shown on a plan that the representative fraction is 1.4752, what is the scale of the plan, reading chains?

2. Draw a scale for a plan where 90 feet is represented by 1 inch to read 5 feet; and print over it neatly—Scale 90 feet to 1 inch.

3. Draw a parallelogram having its two sides 5 and 7 inches long and the acute angle 45 degrees.

4. Describe a circle of three inches diameter and draw two tangents to the circle from a point 2 inches outside it. Show the construction.

5. Draw five lines parallel to one another and 1/4 of an inch apart, one heavy, one medium, one very fine, one with single dots and one with chain dots.

6. On a base of four inches construct a right angled triangle and inscribe in it a circle, inking it in carefully.

FINAL EXAMINATIONS

BOTANY AND TIMBER, ETC.

1. Describe briefly the various methods adopted by plants for the dispersions of seeds and for self-preservation.

2. Describe the chief functions of the leaf in plant life.

3. Give the object of pruning trees and transplanting and thinning vegetables.

4. Give the different methods of propagating plants and explain each method.

5. Give a brief description of the commercial timber in Northern Ontario in the order of its importance.

6. What kind of timber is the most durable for railway ties in Ontario?

7. A log being 32 feet in length, with top and butt measurement 20″ x 24″ diameter respectively, give the contents in board measure.

8. How many cubic feet of timber in a pile of pulp wood 8 feet long, 4 feet high and 4 feet wide, each piece 12 inches in diameter?

REGISTRY ACT, MUNICIPAL ACT, ETC.

1. Give the form of Surveyor's Certificate on plans for registration.

2. Where land is surveyed and subdivided for the purpose of being sold or conveyed in lots by reference to a plan which has not been already registered, what must be done to comply with the Registry Act? Give description in detail.

3. Upon whose request must a municipality prepare a *complete* plan of a city, town or village, etc., not jointly surveyed and one entire plan of such survey made and registered?. Give a brief description of what must be shown upon such a plan and by whom signed, etc.

4. Where any land has been sold or conveyed in lots or parcels by metes and bounds or in any other manner without a plan having been registered under this Act or any other Act showing such sub-

divisions, lots or parcels, etc., are not distinguished by numbers of letters, what is the manner of procedure in such cases upon the application of the inspector who signs such a plan?

5. Give a brief description of the method of opening, altering, closing, widening and diverting of any public street.

6. What constitutes a public highway, and in whom is the fee vested?

7. In any township in which the concessions have been surveyed with double fronts and the division or side lines drawn from the posts at both ends to the centre of the concession do not meet, and road allowances have been laid out along such lines, what is the method of procedure provided in the Municipal Act to connect such ends?

8. Give a brief description of "The City and Suburbs Plans Act" which came into force on 4th May, 1912.

LEVELLING.

1. Define a level line, a horizontal line, direct levelling, indirect levelling, precise levelling and geodetic levelling, a speaking rod, a target rod, a bench mark and a turning point.

2. Give a description of the instruments used in determining elevations and their adjustments.

3. Describe a Y level and a Dumpy level and the method of making the several adjustments, including the peg method.

4. Explain the conditions most conducive to accurate determinations of elevations:

(a) With the best levelling instrument.

(b) With barometers.

(c) With angle measuring instruments.

5. Tell what you know about precise levelling and in what manner it differs from ordinary levelling.

6. How are the readings on a levelling rod affected by refraction and curvature, and what would be the approximate correction for these combined at a point half a mile distant?

7. Explain fully the practice in determining a line of levels, also a level line and the condition to be considered in determining the length of sight.

8. The following B. & F. readings are given to construct a form of field book and to find the elevations of the several points and also prove the correctness of the work.

	B.	F.	Elev.
1.....	6.629		100
2.....	4.833	3.436	
3.....	0.669	6.512	
4.....	1.170	10.779	
5.....	1.636	9.864	
9.....	9.952	11.417	
7.....	11.606	1.321	
8.....	8.944	1.150	
9.....	6.360	1.919	
		5.421	

9. How would you determine the value of one division of your graduated level scale in seconds of arc?

10. With transit reading stadia rod 1 in 100 the reading on the rod was 3.25 feet and elevation 5 degrees 35 minutes. What was the altitude of the point above the instrument?

CURVES.

1. Explain the meaning of the following terms referred to on Railway Curves: Degree of Curve, Middle Ordinate, External Distance, Tangent Distance and Long Chord, and illustrate by diagram.

2. Find the length of Curve, Tangent Distance and Middle Ordinate for a 3° 10′ Curve, having a central angle of 16° 26′.

3. A 14° 40′ curve is to begin at stake 32+75, having a central angle of 76° 36′. Give the deflection angle for each station from P. C. to E F. and the Tangential angle at P. T.

4. Show how you would locate the first four stations in Problem 3, by offsets from the Tangent, without a transit.

5. In order to relocate the curve in Problem 3 for track centres, it becomes necessary to substitute a 100-foot tape used in the original location for a 50-foot tape. Find the correction to apply to the 50-foot taps in order that the two located lines may coincide.

6. A 4° curve joins two tangents making an angle of 38° at the vertex; it is found necessary to move the middle point of the

curve 25 feet nearer to the vertex. Find the change required in the radius and point of curve.

7. Having located an 8° curve, A, B, C, ending in a tangent, C, D, it is required to compound the 8° curve into a 12° curve at the point B, to end in a parallel tangent 14 feet in towards the centre of the curve from C, D. Find the point B from C on the curve.

8. Find the middle ordinate of a 30-foot rail when curved for a 20° curve.

9. Show by diagram the meaning of a No. 9 Frog and find its angle.

SPHERICAL TRIGONOMETRY.

1. (a) Define the meaning of Polar triangle, Spherical excess and Line.
   (b) In a right-angled spherical triangle prove that A equals tan a / sin b.

2. Write Napier's Rules of Circular Parts.

3. Given A equals 46° 15′ 25″, a equals 42° 18′ 45″, C equals 90°. Find C and B.

4. Given a equals 68° 20′ 25″, b equals 52° 18′ 15″, C equals 117° 12′ 20″. Find A.

GEOMETRY.

1. Corallary 1. All the interior angles of any rectilineal figure, together with four right angles, are equal to twice as many right angles as the figure has sides.

2. The complements of the parallelograms which are about the diameter of any parallelogram are equal to one another.

3. If a straight line be divided into any two parts, the rectangle contained by the whole and one of the parts is equal to the rectangle contained by the two parts, together with the square on the aforesaid part.

4. The opposite angles of any quadrilateral figure inscribed in a circle are together equal to two right angles.

5. In a circle the angle in a semi-circle is a right angle, but the angle in a segment greater than a semi-circle is less than a right angle, and the angle in a segment less than a semi-circle is greater than a right angle.

6. If from any point without a circle two straight lines be drawn, one of which cut the circle, and the other touches it, the rectangle contained by the whole line which cuts the circle, and the part of it without the circle, shall be equal to the square on the line which touches it.

7. Inscribe a circle in a given triangle.

8. Describe a square about a given circle.

9. To describe a circle about a given square.

10. Define Obtuse angle, Diameter, Isosceles triangle, Rectangle, Rhombus, Trapezium.

TRIGONOMETRY.

1. Prove that a radian angle is a constant. One angle of a triangle is 45° and another angle is $5\frac{11}{8}$ radians. Express the third angle in degrees and radians.

2. Prove that

$$\left(\frac{1-\sin^2 \text{Cos A}}{\text{Cos A sec A Cosec A}}\right) \times \left(\frac{\text{Sin}^2 \text{A}-\text{Cos}^2 \text{A}}{\text{Sin}^3 \text{A} + \text{Cos}^3 \text{A}}\right) = \text{Sin A}$$

3. Solve the equations:
   (a) $3 \sin e + 4 \cos^2 e = 4\frac{1}{2}$.
   (b) $(a+b+c)(b+3-a) = 3bc$. Find value of Angle A.
   (c) $\text{Sec}^2 e = 8 \tan e - 2$.

4. Prove Geometrically:
   (a) $\text{Cos}(A+B) = \text{Cos A cos B} - \text{Sin A Sin B}$.
   (b) $\text{Tan}(A+B) = \dfrac{\tan A + \tan B}{1 - \tan A \tan B}$

5. A and B are two places which are inaccessible the one from the other. C is third station. Knowing that A, C is 435 ft., B, C is 264 ft., and the angle A, C, B is 81° 25′, find the distance from A to B.

6. In a triangle prove:

(a) $\text{Sin } A+\text{Sin } B+\text{Sin } C=4 \text{ Cos } \frac{A}{2} \text{ Cos } \frac{B}{2} \text{ Cos } \frac{C}{2}$

(b) $\text{Cos } A=\frac{b^2+c^2-a^2}{2\,b\,c}$

(c) $\text{Cos } \frac{A}{2}=\sqrt{\frac{S\,(s-a)}{b\,c}}$

(d) $\text{Tan } \frac{(A-B)}{2} \frac{a-b}{a+b} \text{ Cos } \frac{C}{2}$

N.B.—The solution of any three formulas will be considered a full answer.

7. The angular altitude of a lighthouse is 120° 31′ 46″, and from a point 500 feet nearer the altitude is 26° 33′ 55″. Find height of the lighthouse above the water level.

WATER POWER.

1. (a) Describe briefly three methods of determining the velocity and volume of water passing down a stream.
   (b) It is bound that the velocity is less along the sides and bottom of the stream than in mid-channel. Having ascertained the greatest surface velocity by floats, what reduction would you make in determining the approximate mean velocity?

2. (a) What is approximately the mean annual precipitation or rainfall in Northern Ontario?
   (b) What percentage of the rainfall is available for the development of electrical energy?

3. (a) In estimating the energy capable of being developed on a stream, what are the main points to be considered?
   (b) At what stage of the water do you base your calculations?

4. (a) Describe briefly the Weir Dam Measurement.
   (b) Determine the number of cubic feet of water passing over a weir per minute: Length of weir 66 inches, depth of water $11\frac{5}{8}$ inches.

5. Give the value of X in each of the following questions:
1 cubic foot of water = X Imperial gallons.
1 cubic foot of water = X U. S. gallons.
1 cubic foot of water = X lbs.
1 U. S. gallon weighs X lbs.
The average atmospheric pressure = X lbs. per square inch.
1 English H. P. = X Kilowatts.
1 Metric H. P. = X Kilowatts.

6. At what degree Fahrenheit is pure distilled water at its greatest density?

7. If 1,600 lbs. water fall every second from a height of 16 feet, what is the greatest amount H. P. that can be developed by the stream?

8. The cross section of a stream is S square feet. The mean velocity at point of cross section is V feet per minute. The available head in feet is H. The efficiency of the approaches to the turbines 99%; of the turbines 85%; of the dynamos 95%; and the loss by transmission lines 5%. Give the formula for H. P., the mechanical horse power available.

ASTRONOMY.

1. Define the following Astronomical terms: Altitude, Azimuth, Amplitude, Declination, Right Ascension, Culmination, Hour Angle, Vernal Equinox, First Point of Aries, Perihelion, Aphelion, Obliquity of the Ecliptic. Illustrate by means of a diagram.

2. Explain the meaning of the terms: Precession, Nutation, Aberration, Parallax, Refraction. Which have to be taken into consideration in ordinary astronomical field work, and how applied?

3. October 26th, 1912. Observations to determine the latitude of a station were taken on the sun at its culmination as follows: Observed altitude of the lower limb ⊙ 31° 29′ 30″. Observed altitude of upper limb $\overline{⊙}$ 32° 02′ 10″. The Declination being S 11° 05′ 25″. Find the latitude.

4. Lat. 47° 14′ 05″. Longitude 69° 32′ W. The sun's Declination N. 0° 37′ 58″ and equation of time—7′ 0″.

Watch	Time	Sun's Alt.	H.C.R. on Sun
h	m		
2	04	⊙ = 32° 55′ 30″	226° 03′ 30″
2	09	$\overline{⊙}$ = 32 44 00	227 41 14

Find (a) The H. C. R. on the meridian.
(b) The watch correction to E. Time (75°).

5. Date, October 20th, 1912. Observed altitude of polaris for latitude: Declination 88° 50′ 30″. R. A. 1h. 28m. 45sec.

Observed Alt. of Polaris	Time by siderial watch	
	h m sec	
47° 37′ 12.5	20 10 37	Watch fast
" 39 39.5	" 14 55	2m, 52.9 sec
" 40 29.5	" 17 42	Compute the
" 48 55.5	" 21 16	latitude

6. Date, October 21st, 1912. Place, Lat. 47° 10′ 27″. Long. 69° 31′ 10″.

Face	Time			H. C. R. on Star			H. C. R. on line		
	h	m	sec						
R	18	46	39	1°	40′	00″	214°	41,	45,
				"	"	00	"	"	40
				"	"	00	"	"	35
L	"	50	00	"	"	10	"	"	30

Polaris Dec. 88° 50′ 30.9″ and R. A. 1h. 28m. 45.2sec. Find the meridian reading of the H. circle and the correction to the reading on the line.

7. With the same data given in question 6, find the siderial, mean, and standard times at which polaris will be at its greatest eastern elongation; also the angle the star makes with the meridian on that day. Given the siderial time at mean noon at the place of observation 13h. 47m. 16.53sec.

SURVEY ACT.

Written examination .....75 marks
Oral examination .....75 marks

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1. Explain the difference between a single front concession and a double front concession township. How were they laid out and when was the double front system introduced?

2. How are lot lines to be run in the districts south of Lake Nipissing and the Mattawan River?

3. What steps are necessary to be taken to have the lots in any concession or part of a concession established by planting monuments at the front and rear angles?

4. What is a "proof line"? Draw a diagram illustrating a case in which you would use a "proof line."

5. How are lines to be run in those townships subdivided into blocks of 640 acres in the Districts of Algoma and Nipissing?

6. Give a brief description of the system of "New Nine Mile" townships laid out along the Transcontinental Railway. When was this system introduced?

7. How are the lines to be run in those townships in the Rainy River District that were subdivided into sections in accordance with the Dominion Lands System of Surveys?

8. A farmer wants the boundaries of his lot (No. 7 in the 4th concession in the township of .....) defined by posts planted at the four corners thereof. How would you proceed to do it: (a) In a single front concession; (b) in a double front concession; (c) a sectional survey?

MENSURATION AND LAYING OUT AND DIVIDING OF LAND.

1. (a) Define the terms: Latitude, Departure, Course and Distance.
   (b) How are areas calculated by Latitude and Departure?

2. In the triangle A, B, C, as shown by Figure 5, given the sides A B 180 feet, A C 240 feet, B C 300 feet, find the length of a line P Q parallel to B C that will make the area of A P Q four-ninths of the total area of the triangle.

3. (a) The magnetic bearing of a line as given in a deed bearing date January 1st, 1860, is North astronomically. What is the approximate magnetic bearing today and what the true or astronomic bearing?
   (b) In what part of Ontario does the line of no variation pass, and is the magnetic variation constant throughout the year? If not, describe the various changes.

4. Where a deed is given by metes and bounds, which would give an area different from that in the deed, which will control, the metes and bounds or the area?

5. In re-establishing the outlines of an irregular tract of land it is found that a mistake has been made in one of the courses. Does that raise the presumption of a mistake in other courses?

6. One of the courses in a description by metes and bounds is described as "Northerly." When there is nothing to indicate the inclination to the east or west, what does "Northerly" mean?

7. What is a Conventional Boundary?

8. Find the latitude and departure of a line on a bearing of 37¼ degrees for a distance of 12 chains.

9. Find the area of the north half of Lot 1, Concession 1, Township of Tay (a double front concession township) as shown on Figure 4, plan attached. Give the frontage on each half lot. The measurement on the south boundary in 66 chains, the frontage on the east half is 30 chains, on the west half 32 chains; the course of the frontage of the east half is north 10 degrees west and of the west half north 10 degrees east.

10. Required to divide the quadrilateral A B C D by a line E F, parallel to A B, into two parts, A B F E and D C F E, in ratio M to N. Give the solution for finding B F or A E. (See Figure 1.)

11. In the quadrilateral figure A B C D (Figure 3) required to find a line H Q passing through the point P that will make A D H Q equal to 7/12 of A B C D.

A B	300 feet
B C	192 feet
C D	144 feet
A D	180 feet
D B	240 feet
P E	96 feet
P F	60 feet

Find A Q and D H.

12. Divide the triangle A B C into two parts by a line passing through the point P, so that the area of A H Q is 4/10 of the total area. Find A Q and A H. Where the perpendicular from P to A B is 100 feet and to A C is 60 feet. (See Figure 2.)

ALGEBRA.

1. Simplify $\dfrac{X^2-(Y-Z)^2}{(X+Z)^2-Y^2} + \dfrac{Y^2-(Z-X)^2}{(X+Y)^2-Z^2} + \dfrac{Z^2-(X-Y)^2}{(Y+Z)^2-X^2}$

2. Find the square root of

$$a^6 + a^{\frac{1}{3}} - 6\,(a^4 + a^{\frac{1}{4}}) + 15\,(a^2 + a^{\frac{1}{2}}) - 20$$

(2a) Find the conditions that X^2-px-q may be a perfect square.

3. Find the relations between the roots and coefficients of the equation $ax^2+bx+c=0$, and show that a quadratic equation can have only two roots.

(3a) Show that if a quadratic equation can be satisfied by more than two values of the unknown quantity the equation is an identity.

4. Solve the equations:

(a) $\dfrac{x-2}{x-3}+\dfrac{3(x-11)}{x-4}=\dfrac{4x+13}{x+1}$

(b) $X^2+Y^2=180.$

$X-Y=6.$

(c) $3x^2-7-2\sqrt{x^2-5x+3}=12.$

5. There is a number between 10 and 100 when multiplied by the first digit the product is 280. If the sum of the digits be multiplied by the same digit, the product is 55. Find the number.

6. When is a series said to be: (1) In Arithmetical projection. (2) In Geometrical projection. (3) In Harmonical projection. Give one example of each series.

(6a) Investigate the formulas for finding the sum of an Arithmetical series and the last term.

7. How many terms of an Arithmetical series $16+24+32+40\ldots\ldots$ will amount to 1840? Find the 10th term of the series 256, 128, 64 and the sum to infinity.

8. A municipality issues 15-year debentures bearing $4\frac{1}{2}$ per cent., in payment of a debt of \$6,755.40. Find the equal annum payment that in 15 years would pay both principal and interest of the debt, interest being calculated at $4\frac{1}{2}$ per cent. per annum.

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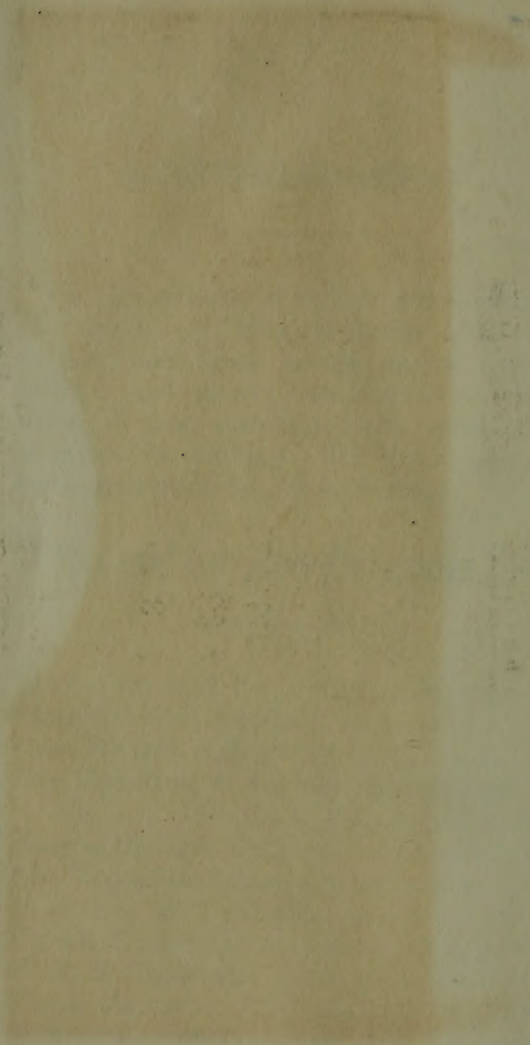

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